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Article IV - 3A

DATA PACKAGE VOLUME II - SUBSYSTEM DATA PART A

PRESHIPMENT REVIEW

FLIGHT MODEL

MAY 1983

CONTRACT NAS 5-24200

Prepared for GODDARD SPACE FLIGHT CENTER Greenbelt, Maryland 20771

REMATIC MAPPER

Unclas CSCL 14B G3/43 00258

(E83-10258) THEMATIC MAPPER FLIGHT MODEL PRESHIPMENT REVIEW DATA PACKAGE. VOLUME 2, PART A: SUBSYSTEM DATA Final Report (Hughes Aircraft Co.) 276 p HC A13/MF A01

N83-26127

HEMATIC MAPPER

SEPT 1982



Proposed for GOODARC SPACE FLIGHT CENTER Grossbeit, Maryland 20771 CONTRACT NAS 5-24200

SEPT 1982

FLIGHT MODEL
PRESHIPMENT REVIEW
DATA PACKAGE
VOLUME II - SUBSYSTEM DATA
PART A

Article IV - 3A



Hughos Ref No. 34596 •

THEMATIC MAPPER

FLIGHT MODEL

PRESHIPMENT REVIEW

VOLUME II

SUBSYSTEMS

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THEMATIC MAPPER

FLIGHT MOLEL

PRE SHIPMENT REVIEW

VOLUME II

SUBSYSTEMS

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2.0 Subsystems Acceptance Data

C

Each of the major subsystems of the Flight Model Thematic Mapper was reviewed as an entity prior to integration into the system. The intent of this section is to present for each major subsystem, acceptance data for the subsystem (test results); reference lists of the configuration status; and reference lists of Non-Conforming Material Reports, Failure Reports (with copies), and Requests for Deviation/Waiver (with copies).

The acceptance data for each subsystem (where applicable) is contained in the Appendix to this report, as referenced in the first subsection for each subsystem.

The second subsection for each subsystem contains a tabular summary of the "as designed" and "as built" configuration lists, showing all applicable drawings, specifications, or standards.

(An "as built" configuration list for the total system is included in Volume I and is also included herein immediately following this page). This is followed by a listing of all items against the subsystem, with copies of NCRM's, RT's, and RD/W's.

SUMMARY
AS-BUILT CONFIGURATION LIST
TM FLIGHT S/N 003

IND	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
1	51065	THEMATIC MAPPER ASSY	J	J ·	J	003
-	,	1111111111 1111 11001	4257A	4257A	4257A	
			4487A	4487A	4487A	
			4557A	4557A	4557A	
			4573A	4573A	4573A	
			4643A	4643A	4643A	
			4658A	4658A	4658A	•
			D143R1	D143R1	D143R1	•
			D144	D144	D144	-
		. •	D146	D146	D146	
			D148	D148	D148	00
			D155	D155	D155	7 2
			D158	D158	D158	7 2
			D161 ·	D161	D161	ORIGINAL OF POOR
	•		D162	D162	D162	20 (-)
			D163	D163	D163	PAGE IS
			D164	D164	D164	\$ <u>6</u>
			D165	D165	D165	5 m
			W166	W166	W166	7 53
			W169	W169	W169	
			W170	W170	W170	
			W171R1	W171R1	W171R1	
			W173	W173	W173	
2	50840	MAIN FRAME ASSY	E	E	E	003
2	52347	ELECTRONICS MODULE ASSY	D	В	В	201
•			4588A	4091A	4091A	
•	•			4113A	4113A	
				4242A	4242A	
•				4293A	4293A	

ID /L	PART NO.	NOMENCLATURE		CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTA NUMBE
3	3533003-100	MULTIPLEXER ASSY		С	С	· c	003
•	3,33003 100			43009	43074	43009	,
	•			43074	65661	43074	
				65661	65662	65661	
				65662	W124	65662	
				W124	W125	W124	,
				W125		W125	
						**	•
3	50869	POWER SUPPLY ASSY	. *	D	D	D	004
-				2015A	2015A	2015A	· · · .
	· •			2039A	2039A	2039A	
				4347A	4347A	4347A	
	•			D030	D030	D030	·
	•			D068	D068	D068	٠,
	•			W074	W074	W074	
				W092	W092	W092	
			,	W093	W093	W093	1000
				W101	W101	W101	
3	52348	CABLE ROUTING ASSY		F	F	F	005
-				3844A	3844A	3844A	
2	52532	OPTICAL ASSY		F	F	F	003
•	3232			3174A	3174A	3174A	
				4100A	4100A	4100A	
				4187A	4187A	4187A	
				4266A	4266A	4266A	
	•	<u>Q</u> <u>Q</u>		4488A	4488A	4488A	
		OF POOR		4559A	4559A	4559A	
	·	Ŏ H		4656A	4656A	4656A	
		9 A		D-151	D-151	D-151	
		~		D-154	D-154	D-154	1, 1
		AFT OPTICS ASSY		W-148	W-148	W-148	
3	51512	AFT OPTICS ASSY		E	D	D	003
)1J14	7a		3646A	3646A	3646A	
				3925A	3896A	3896A	* * *
				3959A	3925A	3925A	
				4585A	3959A	3959A	•
				-700M	4134A	4134A	

Control of the Contro

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
4	50795	PRIME FOCAL PLANE ASSY	J	11	Н	201
. •			. W126	3934A	. 3934A	
•				3968A	3968A	
			` - ·	3982A	3982A	
				:W126	W126	
3 .	51200	RADIATIVE COOLER ASSY	E	E	E	003
3	31200	RAPIATIVE COOLER ASSI	3922A	3922A	3922A	
			4201A	4201A	4201A	
			4216A	4216A	4216A	
			4269A	4269A	4269A	•
			SB-W032	SB-W032	SB-W032	
			W144	W144	W144	
			W147	W147	W147	
			W149	W149	W149	
			W151	W151	W151	
4	50973	COLD FOCAL PLANE ASSY	В	В	В	201
4	30973	COLD FOORE FEMAL MOOF	2870A	2870A	2870A	
			3895A	3895A	3895A	•
			4173A	4173A	4173A	
	•		SB-D004	SB-D004	SB-D004	
			W102R1	W102R1	W102R1	
	•		W109	W109	W109	
			W111	W111	W111	
			W134	W134	W134	
			W135	W135	W135	*
	*				*	
3	51337	TELESCOPE ASSY	D	Ð	D	002
J		ÖŽ	3866A	3866A	3866A	,
		TELESCOPE ASSY TELESCOPE ASSY POOR	3917A	3917A	3917A	
		~ -	W129	W129	W129	•
		Q PA	W136	W136	W136 .	
	•	PAGE				
		Z Z				

ND VL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
3	52534	RELAY OPTICS ASSY	D 1145A 4097A	D 1145A 4097A	D 1145A 4097A	003
2	3533002-100	SCAN MIRROR ASSY	E	D 13121	D 13121	004
				13122 64358	13122 64358	
				64363 64369 64374	64363 64369 64374	
				W020	W020	

SECTION 2.1

Section 2.1.1.

Multiplexer

Performance Data

The acceptance performance (test) data for the Multiplexer is contained in Appendix A of this report (Vol IV, part A).

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2.1.2 Acceptance Data

2.1.2.1 Configuration Lists

AS-BUILT CONFIGURATION LIST

MULTIPLEXER 3533003-100 S/N 3

ND VL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	3533003-100	MULTIPLEXER	C 43009(R) 43074 65661 65662 W124 W125	C 43074 65661 85662 W124 W125	C 43009 43074 65661 65662 W124 W125	3
			<i>t</i>			
•	3533003-200	MULTIPLEXER	D	D	D	
	3533003-500	MULTIPLEXER	G 65604 65670	G 65604 65670	G 65604 65670 Q	9
	3533003-600	PIN/SIGNAL LIST	B 65659	B 65659	65670 Q B 65659 Q	RGINAL
S	259989	GROUND & VOLTAGE BUS	i A	A	A 6	PA
	3362049	WASHER	-	•	QUALITY	() M T
	3489200	HEATSINK	-	•	-	Ø
	3569200	CONNECTOR	-		•	
	3569201-2	CONNECTOR	43055	43055	43055	
	3569202	ALTERNATE MATL HS236	Α Α	A	A	
	3569203	CABLE ASSY, THINAX	C 65612 65696	C 65612 65696	C 65612 65696	
	3569204-1	CHANNEL SHIM	C	C	C	

ND VL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
	3569205	CABLE ASSY	В	·. B	В	
	3569206-2	GASKET	A 11457	A 11457	A 11457	·
	3569207	SHIM, RF CONNECTOR	• •	- ·	-	
	3569208	MULTIPLEXER	A 43003 43064 65600 65649 65674	A 43003 43064 65600 65649 65674	A 43003 43064 65600 65649 65674	
	3569209	MULTIPLEXER	A 43004 43066 43088	A 43004 43066 43088	A 43004 43066 43088	
	3569210	MULTIPLEXER	Ē 65673 65692	E 65673 65692	E 65573 65692	3
	3569211	WIRE LIST	F 43060 43097 65614 85660	F 43060 43037 65614 65660	F 43060 43097 65614 65660	_
	3569213	COVER	D	D	. D 위	ORIG
	3569214	COVER, TOP REAR	D 43072	D 43072	D POOR 43072 Q	inal P
1.	3569215	TEMP COVER	В	В	43072 QUALITY	À GE
	3569216	CHASSIS ASSY	В	В	B ₹	ā
	3569218	CHANNEL CONNECTOR PLATE	D 11428 11469(P)	D 11428	D 11428 11469	
	3569219	PLATE, REAR	С	C	C	

36 Hendrich et soch is et s	enger, ar dan një tipir anje arrijajokaris, ma një shejma 🍪	greene describer herzen trompres processes processes trompres to the trompress of the second of the	ili makeng angamiya bara, indone maki jahijim debitat Bang Tini		ار این پیشترین در	Ö
LND	PART HO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT SE REVISION NU	RIAL
	3569220	PLATE CHASSIS	0 11470(P)	D	0	
	3569221	PLATE CHASSIS	B 11471(P)	В	B	
	3569222	PLATE, FRONT	D 11472(P)	D	D	
. •	3569223	BUS ASSY	11497	11497	11497	
	3569224	MODULE	F 65637 65677	F 65637 65677 65694	F 65637 65677 65685	
			65685(P) 65694 D026 D086	D026 D086	65694 D026 D086	
	3569225	PRINTED WIRING BOARD	D 43080	D 43080	D Q Q Q Q	
	3569226	HEATSINK	C	C	OF POOR	
	3569228	PRINTED WIRING BOARD	F 11492(P) 11494 43087 D018	F 11494 43087 D018	PAGE 100 PAG	
	3569229	ALTERNATE DESIGN	C 65642	C 65642	C 65642	
	3569234	MODULE	0 43010 43037 65626 65646 65668	0 43010 43037 65626 65646 65668	D 43010 43037 65626 65646 65668	3

N!, .VL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
	3569235	ALTERNATE WIRING	A 65641 65643 65676(P)	A 65641 65643	A 65641 65643	
	3569240	MODULE	E 11464(P) 43011 D014 D084	E 43011 D014 D084	E 43011 D014 D084	3
	3569241	ALTERNATE WIRING	G 65617 65627 65628 65634	G 65617 65627 65628 65634	G 65617 65627 65628 65634	
	3569247	MODULE	D 11465(P) 43012 43039 43048 D028 D083	D 43012 43039 43048 D028 D083	D 43012 43039 43048 D028 D083	ORIGINAL PAC
	3569248	ALTERNATE WIRING	D 43083	D 43083	D 43083	PAGE IS
	3569254	MODULE	F 11466(P) 43013 43040 65603(C) D013 D082	F 43013 43040 D013 D082	F 43013 43040 65603 D013 D082	3
	3569255	ALTERNATE WIRING	H	F 43085 43090 43091 43093 43094	F 43085 43090 43091 43093 43094	3

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IND LVL	PART NO.	NOMENCLATURE		CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
	3569261	MODULE		G D012 D059 D081 D106	G D012 D059 D081 D106	G D012 D059 D081 D106	3
	3569262	ALTERNATE WIRING		E 65682(P) 65687(P) 65698	E 65698	E 65682 65687 65698	ORIGINAL OF POOR
	3569264	ALTERNATE DESIGN WIRING	•	65622 65636 65693	65622 65636 65693	65622 65636 65693	PAGE IS
٠.	3569268	TB ASSY		A 11420 11448(R) 11449	A 11420 11449	A 11420 11449	
,	3569269	COMPONENT ASSY		В	В	B	3
	3569270	INSULATOR BOARD		A	A	A	
	3569272	MDL FILTER ASSY		В	В	В	5
	3569273	FILTER FRAME		-	•	. .	
	3569277	MULTIPLEXER		A 43032 43045 43050 43058 43063	A 43032 43045 43050 43058 43063	A 43032 43045 43050 43058 43063	3
	3569278	CONVERSION UNIT	• ;	В	В	В	
	3569279	COVER		В	В	В	
	3569280	COVER		A	A 11444	A 31444	e de la companya della companya della companya de la companya della companya dell

IND	PART NO.	NOMENCLATURE	· · · · · · · · · · · · · · · · · · ·	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
	3569282	WIRE LIST		D 43054(R) 43061 43076	D 43061 43076	D 43054 43061 43076	
	3569283	COMPONENT BOARD ASSY		C	C ,	C	•
	3569284	TERMINAL ASSY		A	A	. A	
	3569285	ALTERNATE PARTS		65658 65669	65658 65669	65658 65669	0.0
	3569290	CONNECTOR PLUG		C	С	. C	yr on P
	3569291	NUT, HEXAGON		≐ 	-	-	ORIGINAL OF POOR
	3569292	TRANSFORMER		A	A	A	QU.PAC
	3569293	1024 BIT-PROM	* 2	A W026	A W026	A W026	PAGE IS
	3569300	WIRE WRAP		D 43001 43005	D 43001 43005	D 43001 43005	
	3569301	FILTER ASSY		В	В	. B	
	3569309	INDUCTOR		A	A	A	10,11, 12,24, 45,56
	3569314	INTERCONNECTION		E	E	E	
	3569315	SCHEMATIC DIAGRAM		C 65691	C 65691	C 65691	
	3569316	SCHEMATIC DIAGRAM		E 65679 65689(P)	E 65679	E 65679 65689	
	3569317	SCHEMATIC DIAGRAM		В	В	B	المناف المستعدد المستعدد المستعدد

TND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
	3569318	SCHEMATIC DIAGRAM	E	E	E	
	3569319	SCHEMATIC DIAGRAM	D	D	D	
	3569320	SCHEMATIC DIAGRAM	С	С	С	
	3569321	SCHEMATIC DIAGRAM	D	D	D	
	3569322	SCHEMATIC DIAGRAM	C	С	C	
	3569323	SCHEMATIC DIAGRAM	D	D	D	
	3569324	SCHEMATIC DIAGRAM	E	Ε	Ε	
	3569328	INTERCONNECTION	G 65684(P) 65695	G 65695	G 65684 65695	
	3616302	CABLE	A	A -	A	
,	3905369	HYBRID-INPUT	A 11445 11459 11476 11477 00010	A 11445 11459 11476 11477 00010	A 11445 11459 11476 11477 D0010	00
	3905970	SCHEMATIC DIAGRAM	. B	8	В	ORIGINAL OF POOR
	3905971	HYBRID-INPUT	A	A	A	VAL OR
	3905973	MICROCIRCUIT	D 11446 11460 11479 DOO10	D 11446 11460 11479 D0010	D 11446 11460 11479 D0010	PAGE IS

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LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUYLT REVISION	SERTAL NUMBER
	3905977	MICROCIRCUIT	C 65699(N)	C D0010	C D0010	

QUALITY ASSURANCE

DATE

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POOR QUALITY

POOR QUALITY

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POOR QUALITY

DATE

DATE

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MULTIPLEXER

Listing of Liens

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MULTIPLEXER

P/N 3569210

FLIGHT Failure Report. No.		PROTOFLI	GHT	ENGINEER		
		Failure No.		Failur No	e Report	
Open	Closed	Open	Closed	Open	Closed	
F3658- (Spare) F4252- (Spare)	F0372 F0373 F0374 F0381 F2808 F2812 F2813 F2814 F2815 F2816 F2817 F2818 F2819 F2820 F2821 F2822 F2823 F2824 F2825 F3657 F3660 F4253 F4255 F4256 F4257 F4256 F4257 F4266 F4257 F4266 F4267 F4268 F7295 F7299		F0360 F1929 F0361 F1930 F3062 F1931 F0363(Void) F0364 F1932 F0365 F1933 F0366 F1934 F0367 F1935 F0368 F1936 F0369 F1937 F0370 F1939 F0371 F1940- F0375 (Void) F0376 F1941- F0377 (Void) F0378 F1942 F0379 F1943 F0380 F1944 F0383 F1945 F0384 F1946 F0385 F1947 F0386 F1948 F0387 F1949 F0388 F2805 F0389 F2806 F0390 F2807 F0391 F2810 F1919 F2811 F1920 F2814 F1921 F3005 F1922 F4264 F1923 F1924 F1925 F1926 F1927 F1928		F0547 F1938 F2755 F5184	
*Spare PWE Failed at	card level (3569224)					

MULTIPLEXER

P/N 3569210

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FLIGHT MODEL

Failure Repor	, Numbers
Open	Closed
F3658(Spare)	F0372
F4252(Spare)	F0372
r4232(Spare)	F0374
•	F03/4
	F2808
	F2812
	F2813
	F2814
	F2815
	F2816
	F2817
	F2818
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•	F2820
	F2821
	F2822
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	F2824
	F2825
·	F3657
	F3660
	F4253
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	F4255
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	F4257
	F4265
	F4266
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	F7295
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	F7299

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HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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1	_	1. PROGRAM PARTY THOMPS ATTE MATERIAL 1 GLE 330 1. SOM	ELT COMPRED 0900	6 6 & covered
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	1148	C/A. OPSTATOL INSTRUCTOR]
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_	ENGINE EMINGINEL LABILITY	24. RASIC CAUSE 39 VERIFIED FAILLIARE COFFOCTIVE PARTS TEST FROC. COFFOCTIVE PARTS TEST SET-UP	DRAM HOUGH DRIVESSOR SARTYESA E CHEMANAROW C	
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Hughes

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATIONS GROUP

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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FAILURE ANALYSIS REPORT

F28/2

Hughes

HUGHES AIRCRAFT COMPAN TECHNOLOGY SUPPORT DIVISION

ABSTRACT

ORIGINAL PAGE 13 OF POOR QUALITY FAR No. 8499 Page 1 of 8
Program Thematic Mapper

Date of Feilure Date of Receipt Request No Ledger No CMER No	3-28-80 4-17-80 F2312 J2905-71 28726	Requesting Engineer R. Julian Phone Bldg./MS 377/P314 CML Project Engineer L. Ferrin Phone Bldg./MS H2/C346
DEVICE INFORMATION HAC P/N	3905969	Date Coda
Dovice Type	Hybrid	Lot Number
Vendor	Hughes	Circuit Symbol
Vendor P/N	82577	Unit S/N
Device S/N	525	Module S/N

The reported failure mode "Static DCR offset voltage of channel 4 out of specification", was verified. Also a similar failure was observed on channel 3. The failure was isolated to N-channel HOS FET transistors Q3 and Q4. Shorts between source and gate of both transistors and a short between source and substrate of Q3 were noted. Internal examination revealed smearing and scratches on both transistors. Scanning Electron Microscope examination disclosed holes under the metalizations of both transistors.

The primary cause of the failure is believed to be mechanical damage which caused the shorts either via smeared metalization or by scratches which damaged underlying exide resulting in holes in the silicon.

Extraction of the Approval Date Approval Date

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FAILURE ANALYSIS REPORT

ORIGINAL PAGE IS

OF POOR QUALITY

F28/2

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TECHNOLOGY SUPPORT
DIVISION

FAR No.

8499 Page 2 of 8

Program .

Thematic Mapper

COMPONENT ENGINEERING TECHNICAL COMMENTARY:

HAC hybrid (analog input buffer) Part No. 3905969 was submitted for failure analysis.

Electrical tests were performed to Specification Number TS 32015-030. Parameters were within specification requirements, except for offset voltage on channel 3 and 4 which exceeded the maximum limits.

Internal examination revealed scratches and smearing of metalization on N channel MOS FET transistor Q3 & Q4 and Q1 transistor had a defect on a bonded lead.

Electrical probing confirm that Q3 was shorted from source to gate, source to substrate and gate to substrate. Q4 was also shorted from the source to the gate.

This writer is in agreement with this failure analysis report and its conclusion.

RECOMMENDATIONS:

No corrective action required by TSD

CORRECTIVE ACTION REQUIRED BY TSD YES O NO &

Appleanale VI/80

11/2/2/2/2/2

PAGE 3 of 8

ORIGINAL PAGE IS OF POOR QUALITY F28/2

Reported Failure Mode:

Static DCR offset voltage of channel 4 out of spec.

Available Data:

None.

Outline of Analysis:

- 1. External Visual Examination
- 2. Particle Impact Noise Test
- 3. Electrical Test
- 4. Internal Examination
- 5. Electrical Probe Measurements.
- 6. Scanning Electron Microscope (SEM) Examination

Results of Analysis:

- -1. External Visual Examination.
 - a) Case examination disclosed no anomalies.
 - b) Markings:

TOP
Hughes Logo
B2577
3905969
SER NO 525
BOTTOM
Hughes Logo
B2577
3905969
SER NO 525

2. Particle Impact Noise Test.

No loose particles were detected.

3. Electrical Test.

The hybrid was tested in accordance with HAC ANALOG IMPUT BUFFER test specification number TS32015-030 for the following parameters: 1KHz GAIN, DC offset, NOISE, 3dR Bandwidth Static DC Restoration offset voltage and power supply current at +25°C. All the parameters measured were within specified limits except for Static DC Restoration offset voltage of channel 3 and 4 which exceeded the maximum limits. Static DC Restoration voltages were measured to be as follows:

Channel 3 = -684mV should be 0 + 0.5mV maximum Channel 4 = +136mV should be 0 + 0.5mV maximum

4. Internal Examination.

Internal examination at magnifications 194% and greater revealed the following anomalies:

- a) Scratches and smearing of metalization on N channel MOS FET transistors Q3 and Q4. (See Figures 1 through 5.
- b) A lead bonding defect on Q1 transistor. (See Figure 6).

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F28/2

Results of Analysis: (continued)

5. Electrical Probe Measurements.

Electrical probing, combined with circuit isolation via lifting the source, drain, and gate leads of N-channel MOS FET transistor Q3 and Q4 of the substrate indicated the following:

- a) Source to Gate of Q3, channel 3, had a 350 ohm short.
- b) Source to Substrate of O3. channel 3 had a 57.5K ohm short.
- c) Gate to Substrate of Q3, channel 3, had a 52.6K ohm short.
- d) Source to Gate of Q4, channel 4, had a 600 ohm short.
- 6. Scanning Electron Microscope (SEM) Examination.

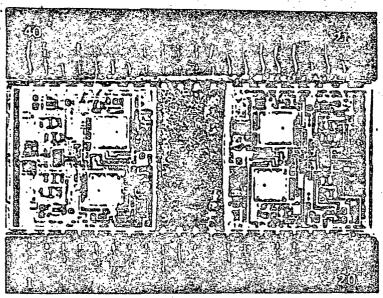
SEM examination after metalization removal disclosed pinholes in the Source region of Q3 and Q4 and a pin hole in the gate bond pad region of Q3. (See Figures 7 through 11)

Conclusion:

The reported failure mode "Static DCR offset voltage of channel 4 out of spec." was confirmed. Also the Static DCR offset voltage of channel 3 exceeded the maximum specified limits of 0mV + 0.5mV. The failure was isolated to N-channel MOS FET transistors $Q\overline{3}$ and $Q\overline{4}$, of channel 3 and 4. Electrical probing, combined with isolation indicated that the Source and Gate of both transistors were shorted. Also the Source and the Substrate of $Q\overline{3}$ were shorted. Internal examination revealed scratches on both transistors expecially under the Source and Gate bond, and in the metalization of the Source and Gate

Scanning electron microscope examination after metalization removal disclosed pinholes in the oxide under the metalization of both transistors.

Analysis disclosed mechanical damage in the form of smearing and scratches in the metalization. Smearing of the metalization may have caused a short. The scratches are believed to have damaged the underlying oxide resulting in the pinholes found during SEM examination. One or more of the pinholes may have also been the cause of a short. The primary cause of failures is believed to be mechanical damage to the O3 and O4 chips.



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FAR. NO. 8499 PAGE 5 of 8

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Figure No. 1 Sample No. 525

Overall internal view of the hybrid.

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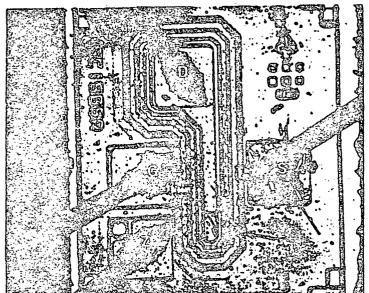


Figure No. 2 Sample No. Q3

Overall view of Q3 transistor Arrows point to the scratches on the chip.

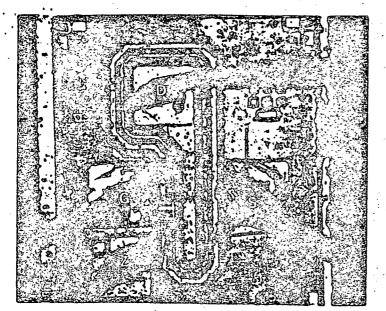
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Figure No. 3 Sample No. 03

Magnified view of the anomaly shown in Figure 2.

(1338X)



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Figure No. 4 Sample No. Q4

Overall view of Q4 transistor. Arrows point to the scratches on the chip.

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Figure No. 5 Sample No. Q4

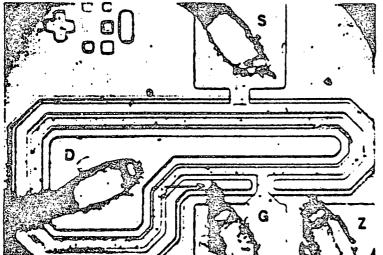
Magnified view of the anomaly shown in Figure 4.

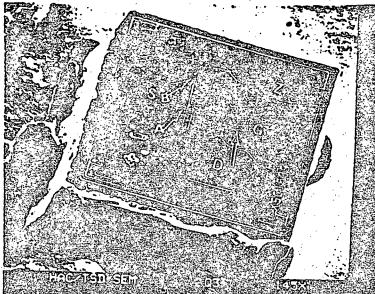
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Overall view of Q1 transistor chip Arrow points to lead bond anomaly.

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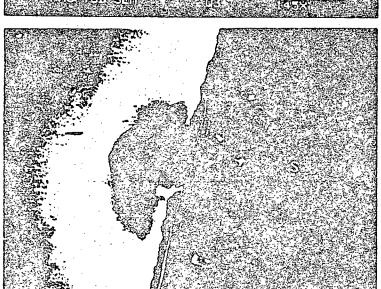


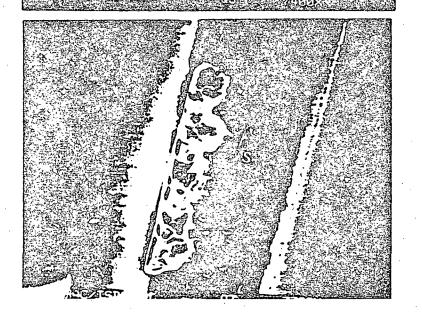


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FAR. NO. 8499 PAGE 7 of 8

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Figure No. 7 Sample No. Q3

SEM view of Q3 after metali; removal with pinholes indica

(145X)

Figure No. 8 Sample No. Q3

Magnified view of pinhole shown in Figure 7 Arrow B.

(7400X)

Figure No. 9 Sample No. Q3

Magnified view of the pinhol shown in Figure 7, Arrow A.

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FAR. NO. 8499 PAGE 8 of 8

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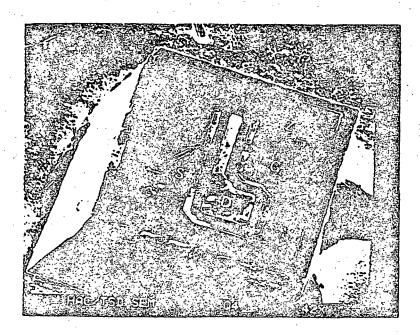


Figure No. 10 Sample No. Q4

SEM view of Q4 transistor after metalization removal with pin-hole indicated.

(142X)

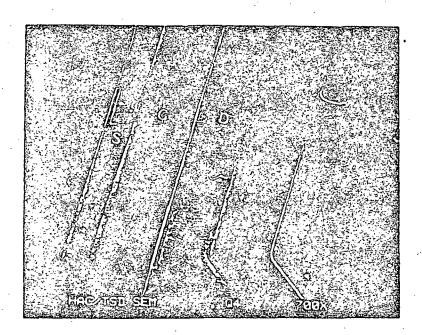


Figure No. 11 Sample No. Q4

Magnified view of the pinhole shown in Figure 10.

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HUGHES HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT CONTINUATION SHEET

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	identify entries by referencing fr block number in column. Date each entry	•	SHEET.	IONAL PROVIDENCE (S) USED
	The failure reported here (excessive gain of an analog input buffer) affect	s onl	y the
	output of the analog input buffer hybird. The only sensitive point			
-	affected output is the corresponding analog multiplexer hybird anal	og input	. Th	era is
	no possibility of damage to this input because the inputs are desig			
	applied voltages of -2V to +10V, whereas the analog input buffer hy			
	diode clamps which limit its output voltage range even under single	failur	cond	itions
	to the range -0.7V to +3.7V.			-
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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT

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HUGHES FR2821 CONTINUATION SHEET hughes aircraft company FR SERIAL NO. ADDITIONAL PR CONTINUATION SHEET(S) USED ·LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON identify entries by reperencing fr block number in column. Date each entry. The failure reported here (noise on analog insert buffer outputs) affact only the output of the analog input buffer hybird. The only sensitive point connected to the affected output is the corresponding analog multiplexer hybird analog insert. is no possibility of damage to this input because the finputs are designed to withstand applied voltage of -2V to +10V, whereas the analog input buffer hybird incorporates dioda clamps which limit its output voltage range even under single failure conditions to the range -0.7V to +3.7V.

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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HUGHES

HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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HUGHES LINCART COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SANTA BARBARA RESEAFCH CENTER A Subsidiery of Hughes Australt Company

INTERNAL MEMORANDUM

TO: R.J. Wilkerson 51-41

CC: See Distribution List

DATE: 13 April 1981

F2825

REF: HS 236-7402

PE 81/72

FROM: L. O'Connell

51-41

BLDG. 774 MAIL STA. 39

EXT. 4485

SUBJECT: Input Buffer Hybrid (P/N 3905969)
Failures

On February 2, 1981 the Product Effectiveness Manager for the TM Program, Mr. R.J. Wilkerson, and the author of this memo conducted a review of the manufacturing data for subject hybrids. The purpose of this review was to determine if a generic failure mode was common to the five hybrids that failed in the multiplexer.

Investigation findings are as follows:

- 1. Sixty-one hybrid manufacturing records were reviewed.
- Defects in the manufacturing cycle were random with no known trend.
- There was not a bonding process problem and all hybrids were subjected to 100% pull test.
- Four of the five failed hybrids had a history of major rework/workmanship problems.
- 5. Unable to locate a reliability to process/design problem
- 6. All operations on the Quality History Records were complete and Air Force concurrence was on all operations and inspections as required. Some mimor documentation problems were found, however they had no effect on the hardware.

In addition to the review of the Manufacturing records, as stated above, the Reliability Organization reviewed the five Failure Reports for subject Hybrids and their findings are as follows:

1. FR 1935 (S/N 523) and FR 2816 (S/N 554).

These Hybrids had excessive gain. S/N 523 was sent to Technical Services Division (TSD) for failure analysis. The failure mode "Excessive Gain" was confirmed. The cause of the failure was a shorted capacitor due to a scratch mark on the surface of the Capacitor. (Mechanical damage to the capacitor oxide caused the short).

2. FR 2812 (S/N 525)

This Hybrid failed when the DC level changed in the DC Restore Circuit. This Hybrid was sent to TSD for analysis. The failure mode "Static DCR Offset Voltage of Channel 4 out of Specification", was verified. The failure was due to shorts between MOS FET transistors Q3 and Q4. The cause of the failure was mechanical

To: R.J. Milkerson
Subject: Input Buffer Hybrid (P/N 3905969) Failures

Page 2 HS 236-7402

Faras

damage (smearing and scratches) that damaged the underlying oxide.

3. FR 1937 (S/N 516)

Sensor 4 of this Hybrid failed the Buffer Limit Test. It was not sent to TSD for analysis.

4. FR 2825 (S/N 520)

Sensor 2 of this Hybrid failed for Excessive Droop. It was not sent to TSD for analysis.

5. After the review of the Failure Reports, Failure Analysis Reports and Manufacturing History Records for the above (5) Hybrids, it has been concluded that there are occasions when Hybrids have been delivered with incipent failures that are not recognizable by Inspection after the units are sealed.

Major rework and workmanship defects were found in the History Records of four (S/N 516, 520, 523 and 525) of the five Hybrids. This lends some credance to a correlation between failure mode and manufacturing difficulities.

Conclusions

Analysis of both the Product Effectiveness review of the Manufacturing History Records and the Reliability Review of the Failure Reports and their associated Failur Analysis Reports the following conclusions have been reached:

1. Assuming a correlation between rework/workmanship defects, it appears that latent defects can escape the normal Hybrid In-Process Inspection and Test Techniques.

The findings and comments of the Product Effectiveness Investigative Team was communicated to the responsible Quality Assurance Section Head who has cognizance over the Hybrid Manufacturing Operation.

At this time contract quantities of subject Hybrids for the Thematic Mapper have long been delivered, however the information gained will be extremely useful for future Thematic Mapper buys and other programs

A learning curve in the Manufacturing Process for these highly comple
Hybrid circuits was in effect, as evidenced by the reduction in workmanship defects and parts replacement as the manufacturing process
matured.

F2825

TO: R.J. Wilkerson

Subject: Input Buffer Hybrid (P/N 3905969) Failures

Page 3 HS 236-7402

- 3. Those Hybrids with incipent defects will fail under unit test and thus be eliminated from the system.
- 4. It has been concluded by the undersigned that the integrity and reliability of Thematic Mapper hardware using subject Hybrids has not been impinged.

L. O'Connell

Administrative and Reliability Manager Thematic Mapper Program

LOC: je

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SPACE AND COMMUNICATIONS GROUP

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TP 32015-005 04 SEP 1980 PEYICONED F3650 PAGE 89.

TA SHEET

j.6.2.2 Serial Data and Bit Clock Parameters

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J. 5.2.2 Srrisl Data and Bit Clock (Cont).

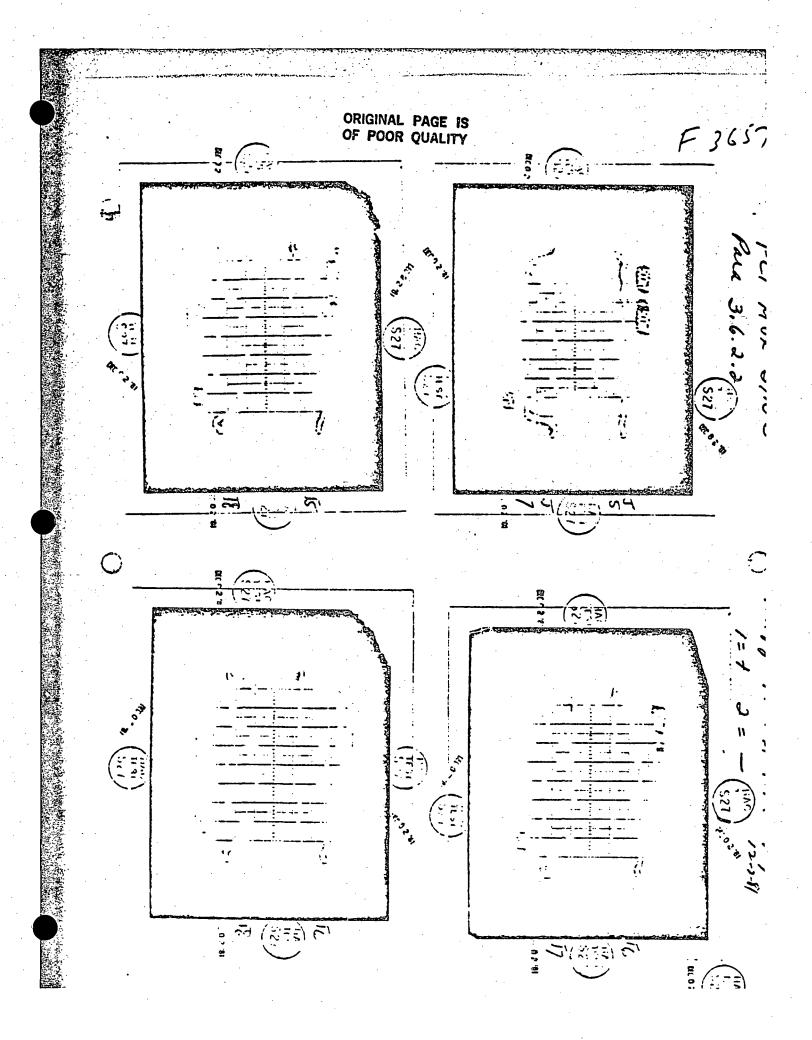
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SATA SHEET



F3657

SANTA BARBARA RESEARCH CENTER A Subsidiary of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: G. Gritt

SUBJECT: Failure Report F3657

CC: L. Altman

DATE: 23 December 1981

REF: HS 236-7786

ROM: PE 227:81 L. O'Connell

51-41:

BLDG. B-11 MAIL STA. 39

EXT. 6293

The Failure mode reported on subject Failure Report was traced to a defective output driver (P/N 911958-001). Reliability cannot submit the defective part

to TSD (Technology Services Division) for Failure Analysis because the responsible Mutliplexer personnel cannot locate the part.

Since the part is not available for analysis the author of this memo has taken the following actions:

1. Requested the Thematic Mapper Parts Board to research the El Segundo Receiving Inspection Records to determine if there were any previous defective output driver's (P/N 911958-001). This has been accomplished and there were no previous failures. (Refer to HS 236-7785 attached).

- Reliability has reviewed the Verified Component Failure List and there were no previous failures.
- 3. Contacted the responsible Multiplexer Engineer and responsible Quality Assurance Engineer for the Multiplexer area and informed them as to the importance of impounding failed parts so they can be analyzed. In addition they were informed that it is mandatory to maintain discipline with all personnel so this type of error (and others) can be prevented on other programs as well as future programs.

Based on the investigation by both the Part's Board and Reliability (listed above) the author is confident that this is a random failure and no generic problem exists with these parts.

L. O'Connell, Manager

Administration and Reliability

LOC:jc

SANTA BARBARA RESLARCH CENTER 2 Subsidiary of Mughes Aircists Comming

INTERNAL MEMORANDUM

TO: 11. O'Conneil 51-41

SUBJECT: Integrated Circuit

P/N 911958-001

CC: F. Carle

DATE: 22 December 1981

REF: HS 236-7785

PE 226:81

FROM: L. Altman

51-41

BLDG. B-11 MAIL STA. 39

EXT. 6257

Per your request, the Parts Board has researched the Parts Analysis Laboratory's (Dept. 46-31-12) records for the previous history of subject part.

These records show no problems with Integrated Circuits (P/R 911958-001).

Product Effectiveness Thematic Mapper Program

LA:jc

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4254

Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

o Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivelts and/or is less than the specified minimum of zero millivelts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

4254

		TEMPERATURE			TO		FROM	
F. R. NUMBER(S)	AMB	+15°C	+50°c	SENSOR	BAND	SENSOR	BAND	
F07296	x			8	1	10	1 .	
F07296	Z			12	1	14	1	
F07299, F07295, F07296	x	X ·	X	2 .	2	4	2 .	
F07299	İ	2		3	2	5	2	
F07295			X	11	2	13	2	
F07299, F07296	Z	Z		12	2	14	2	
F4268	.	x		4	3.	6	3	
F4268	-			6	3	10	3	
F07296	X			10	. 4	12	4	
F4254			X.	14	. 4	16	4	
F4268, F4254, F4257	x	x	X	4	6	1	6	
F4268, F4254, F4257	x	X .	X	3	6	2	, 6	
F4268, F4254, F4257	x	Z	X	1	6	3	6	
F4268, F4254, F4257	x	Z	Z	2	6	4	6	
F4254			Z	5	7.	7	7	
F4254	.		X.	11	7	13	7.	

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

4254

BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER	
1	3.	Ambient	4.11	F4255	
5	6	Ambient	4.90	F4255	

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

4254

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≤ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3		•	F4266
6	·· 3	+15	. 193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	⊀ ∙50	128	37.0	. 129	-0.1	F4267
6	. 3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	- F4267
6	1.	Ambient	193	. 39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

SUBJECT: 3905973 Hybrid Crosstalk Testing

SANTA BARBARA RESEARCH CENTER A Subsidiery of Hughes Aircraft Company

INTERNAL MEMORANDUM

TO: G. Gritt

CC: L. O'Connell

DATE: 22 December 1981

REF: HS 236-2260

PE 225:81

FROM: R. Julian

41-41

BLDG. B-11 MAIL STA. 39

EXT. 6293

Julian

Two 3905973 hybrids were removed in an attempt to fix the crosstalk in Bands 2 and 7 of the S/N 3 Multiplexer. (Ref. FR No.'s F4254, F4257, and F4258). These hybrids are not being formally failure analyzed because:

- Crosstalk is caused by a combination of the hybrids and the unit wiring, and is not observable at the hybrid level.
- 2. The hybrids are tested by observing output levels with an oscilloscope. Errors of the size involved (\$\psi/2\text{Z}\$ of full scale, max.) are not visible on oscilloscopes.
- 3. The hybrids would pass all their tests and are fully functional.

In the course of hybrid repair, we will make static measurements to see whether these hybrids are abnormal in any detectable way.

Richard C. Julian REA, Multiplexer

Thematic Mapper Program

RCJ:jc

HUGHES

ORIGINAL PAGE IS OF POOR QUALITY W/24

SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

F 4255

	RL BEGUNDO, CALIFOR							
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-	9 ASSEMBLY SI	JBASSEMBLY	R		2553005	, ,	- Marc	
ATO	10. C MODULE C MICAM	CARD D						
RIGINATOR	11 OTHER							
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HUGHES

SPACE AND COMMUNICATIONS GROUP

HUGHES AIRCRAFT COMPANY PACE AND COMMUNICATIONS GROUP FAILURE REPORT
CONTINUATION SHEET

FR SERIAL NO.

- 4255

CONTINUATION SHEET LETTER*

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Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the KMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

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	RE	PERATU	TE)	TO	M	FR
F. R. NUMBER(S)	AMB	+15°c	+50°c	SENSOR	BAND	SENSOR	BAND
F07296	x			8	1	10	1
F07296	X		į	12	1	14	1
F07299, F07295, F07296	X	I	x	2	2	4	2
F07299		X	l	3.	2	5	2
F07295			Z	11	2	13 14 6	2
F07299, F07296	Z.	x		12	2		2
F4268		x	l	4			3
F4268	.		j · ·	6	3	10	-3 -
F07296	Z			10	4	12	4
F4254			X	14	4	16	4
F4268, F4254, F4257	X	Z	X	4	6	1	6
F4268, F4254, F4257	X	Z	x	3	6.	2	6 ·
F4268, F4254, F4257	X	Z	X	- 1	. 6	3	6
F4268, F4254, F4257	X	Z	Z	2	6	4	6
F4254			Х	5	7	7	7
F4254			X	11	7	13	7

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

112

3AND	SENSOR	TEMPERATURE	M•/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255
				and the second s

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

325

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≦ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	f. R. NUMBER
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I.	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
ó į	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
#"	a ega					ter to the second	en en en en en en en en en en en en en e
6 .	. 1	+50	128	39.8	129	-0.1	F426.7
6	2	+50	128	37.0	129	-0.1	F4267
6	. 3	+50	128	36.8			F4267
6	4.	+50	128	36.8	192	-0.1	F4267
6	1	Ambien:	193	39.4	160	-0.1	F4265
6	. 2	Ambient	193	37.5	160	-05	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	. 4	Ambient	193	39.6	232	-0-2	F4265

TABLE 3. A/D CONVERSION FAILURES

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SPACE AND COMMUNICATIONS GROUP (L SEGUNDO, CALIFORNIA	PAILURE	REPORT		T 460
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Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

o Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

	RE	PERATU	TEN)	I	OM	FR
F. R. NUMBER(S)	AMB	+15°C	+50°c	SENSOR	BAND	SENSOR	BAND
F07296	x			8	1	10	1.
F07296	x			12	. 1	14	1
F07299, F07295, F07296	x	x	x	2	2	4	2
F07299		X		3	2	5	2
F07295			x	- 11	2	13	2.
F07299, F07296	X	x		12	2	14	2
F4268	.	x		4	3	6	3
F4268		· ·		6	3	10	3
F07296	Z.			10	4	12	4
F4254			X	14	4	16	4
F4268, F4254, F4257	x	x	X	4	6	1 1	6
F4268, F4254, F4257	x	X.	X	3	6	2	6
F4268, F4254, F4257	x	x	X	1	6 .	3	6
F4268, F4254, F4257	X	x	X	2	6	4	, 6
F4254			X	5	7	7	7
F4254		·	x	11	7	13	7

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER	
•	3	Ambient	4,11	F4255	
5	6	Ambient	4.90	F4255	

NOTE: Spec maximum of \pm 3 mV/sec is a self-imposed specification. Instrument error budgets would allow rate up to \pm 120 mV/sec.

TABLE 2. DROOP TEST FAILURES

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AND	SENSOR	TEMP ^O C	STEP #	MAX VALUE (MV) ≦ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6 .	1.	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6 -	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0-3	P4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0-1	F4267
6	3	+50	128	36.8		-	F4267
6	. 4	+50	128	36.8	192	-0-1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Amb1ent	193	37.5	160	-05	F4265
6	3	Ambient	225	35.5	224	-0: ₋ /8	F4265
6	4	Ambient	.193	39.6	232	-0-2	F4265

TABLE 3. A/D CONVERSION FAILURES

SANTA BARBARA RESEARCH CENTER A Subsidiery of Hugnes Aircraft Company

INTERNAL MEMORANDUM

TO: G. Gritt

CC: L. O'Connell

DATE: 22 December 1981

REF: HS 236-2260 PE 225:81

FROM: R. Julian

41-41

BLDG. B-11 MAIL STA. 39

EXT. 6293

SUBJECT: 3905973 Hybrid Crosstalk Testing

Two 3905973 hybrids were removed in an attempt to fix the crosstalk in Bands 2 and 7 of the S/N 3 Multiplexer. (Ref. FR No.'s F4254, F4257, and F4258). These hybrids are not being formally failure analyzed because:

- Crosstalk is caused by a combination of the hybrids and the unit wiring, and is not observable at the hybrid level.
- The hybrids are tested by observing output levels with an oscilloscope. Errors of the size involved (21/2% of full scale, max.) are not visible on oscilloscopes.
- 3. The hybrids would pass all their tests and are fully functional.

In the course of hybrid repair, we will make static measurements to see whether these hybrids are abnormal in any detectable way.

Richard C. Julian
REA. Multiplexer

Thematic Mapper Program

RCJ:jc

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SPACE AND COMMUNICATIONS GROUP

HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATIONS GROUP

EL REGUNDO, CALIFORNIA

FAILURE REPORT

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SPACE AND COMMUNICATIONS GROUP

F4265 FAILURE REPORT

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Tony

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Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

o Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

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FR	FROM TO		0	TEMPERATURE			
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	F. R. NUMBER(S)
1	10	1	. 8			x	F07296
1	14	1	12			X	F07296
3	4	2	2	x	X.	X	F07299, F07295, F07296
2 · `	5	2	3		Z.		F07299
2	12	2	11	Z			F07295
2	14	2	12		X	X	F07299, F07296
3	. 6	· .3	4		X		F4268
3	10	3	6				F4268
4	. 12	4	10	l ·		X	F07296
4	16	- 4	14	X			F4254
6	1	6	4.	x	Z.	x	F4268, F4254, F4257
. 6	. 2	6	3	X	Z .	x	F4268, F4254, F4257
6	3	6	1	Z	X	X	F4268, F4254, F4257
6	. 4	6	2	X.	x	x	F4268, F4254, F4257
7	7	7	5	X			F4254
7	13	7	11	x			F4254

TABLE 1. MULTIPLEXER S/N GO3 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

GNAE	SENSOR	TEMPERATULE	MV/SEC	F. R. NUMBER	
1	3	Ambient	4.11	F4255	
5.	6	Ambient	4.90	F4255	
		,			
]		1		•	

NOTE: Spec maximum of \pm 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to \pm 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

BAND	SZNSOR	TEMP ^O C	STEP #	MAX VALUE (MV) ≦ 31.2 MV		MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
• • • •	· . · · .			-		المستقل المستداد	
1	1	+15	* * * * * * * * * * * * * * * * * * * *	in the second se	32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
		.*	, `		* 1	•	
6 .	1	+30	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	. 129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267.
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6 .	4	Ambient	193	39.6	232	-0.2	F4265
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TABLE 3. A/D CONVERSION FAITHRES

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SPACE AND COMMUNICATIONS GROUP

. LUGUES AIRCRAFT COMPANY

SPACE AND COMMUNICATIONS GROUP

EL SEGUNDO, CALIFORNIA

FAILURE REPORT

F 4266

	el segundo, california	A SA SE CO SES FOR	HE CH	_					
П	PROGRAM NAME AND HUMBER APPLE	~ £330	1 1005L J	1300	MO G DA	18 YR 81			
				HICAM MODULE	CARD PART				
	EQUIPMENT IDENTIFICATION:	NAME	REPMUSI TRAP	\$/H	MARUF	ACTURER .			
	EUNIT Multiplexer		3533003 -	100 3	Mac				
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FAILURE REPORT CONTINUATION SHEET

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Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

o Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplemer requirement, rather than a system level requirement.

FR	OM	TO)	TEMPERATURE		RE	
BAND	SENSOR	BAND	SENSOR	+50°c	+15°C	AMB	F. R. NUMBER(S)
1	10	1	8			x	F07296
1	14	1	12			x	F07296
2	4	2	. 2	X	x	x	F07299, F07295, F07296
2	5	2	3		X		F07299
2	13	2	11	X			F07295
2	14	2	12		X	X	F07299, F07296
3.	6	3	4		8		F4268
3	10	. 3	6	· ·			F4268
4	12	4	10			x	F07296
4.	16	4	14	X			F4254
6	1	6	4	X	X	Z	F4268, F4254, F4257
. 6	.2	6	3	x	x .	X	F4268, F4254, F4257
6	3	6	1	x	x	x	F4268, F4~24, F4257
6	4	6 .	2	Z	x	Z	F4268, F4254, F4257
7	7	7	5	X			74254
7	13	7	11	Z			F4254

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

4266

SENSOR	TEMPERATUTE	MV/SEC	F. R. NUMBER	,
3	Ambient	4.11	F4255	
6	Ambient	4.90	F4255	
	SENSOR 3 6	3 Ambient	3 Ambient 4.11	3 Ambient 4.11 F4255

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

4266

				WAS (741 1777)		MIN VALUE	
BAND.	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≦ 31.2 MV	STEP #	(MV)	f. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	· 2	+15	193	37.3			F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	. 1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8	٠		F4267
6	. 4	+50	123	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

SPACE AND COMMUNICATIONS GROUP

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EL SEGUNDO CALIFORNIA

FAILURE REPORT CONTINUATION SHEET

CONTENUATION SHEET LETTER

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The S/N 003 Multiplexer (P/N 3533003-100) exhibit in its processing of some of its 100 signal char from random wire dressing and other phenomens with do not have any impact upon Thematic Mapper perfinctude: o Sixteen channels exhibit levels of crosstatexceeding specification. They are listed of Two channels exhibit levels of DC Restore specified at room temperature. They are I was reasonable time for several reasons. The crosst would be as likely to create new crosstalk as to The A/D conversion and DC Restore droop rate disby replacing hybrid microcircuits, but the replact the discrepancies are so minor that they might not the performance discrepancies present will have the performance discre		LIVERY DES		•				والبائدة الأروية عد
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The S/N 003 Multiplexer (P/N 3533003-100) exhibit in its processing of some of its 100 signal char from random wire dressing and other phenomens with do not have any impact upon Thematic Mapper perfinctude: o Sixteen channels exhibit levels of crosstatexceeding specification. They are listed of Two channels exhibit levels of DC Restore specified at room temperature. They are I was reasonable time for several reasons. The crosst would be as likely to create new crosstalk as to The A/D conversion and DC Restore droop rate disby replacing hybrid microcircuits, but the replating discrepancies are so minor that they might not the performance discrepancies present will hat Thematic Mapper instrument performance. REA SYS. ENGR.			-			-		
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Repair of the Multiplemar to correct these discreteasonable time for several reasons. The crosst would be as likely to create new crosstalk as to The A/D conversion and DC Restore droop rate disby replacing hybrid microcircuits, but the replathe discrepancies are so minor that they might nof the performance discrepancies present will have the performance discrepancies present will have the performance. REA SYS. ENGR.			-		- ((onein	uec)
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Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

	RE	PERATU	TEM)	T	FROM	
F. R. NUMBER(S)	AMB	+15°c	+50°c	SENSOR	BAND	SENSOR	BAND
F07296	x			8	1	10	1
F07296	X		, i	12	1	14	1.
F07299, F07295, F07296	X	x	X.	2	2	4	2
F07299		Z		- 3	2	5.	2
F07295			x	11	2	13	2
F07299, F07296	Z	х		12	2	14	2
F4268		X		4	3	6	3
F4268	.]		· .	6	3	10	3 .
F07296	X			10	4	12	4 .
F4254			. %	14	4	16	4
F4268, F4254, F4257	x	X	X	4	6	1	6
F4268, F4254, F4257	Z	Z	X	3	. 6	.2	. 6
F4268, F4254, F4257	X	Z	x	1	6	3	6
F4268, F4254, F4257	x	Z	Z.	2	. 6	4	6
F4254			x	5	. 7	7	7
F4254	-		x	11	7	13	7

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

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BAND	SENSOR	TEMPERATUTE	MV/SEC	7. R. NUMBER	
1	3	Ambient	4.11	F4255	
5	6	Ambient	4.90	F4255	

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rane up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

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Band	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) ≦ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	. 1	+15	· · · · · · · · · · · · · · · · · · ·		32	-0.3	F4266
7 -	13	+15	:		241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3	• •	•	F4266
6	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	1	+50	128	39.8	129	-0.1	F4267
ó	2	+50	128	37.0	. 129	-0.1	F4267
6	3	+50	128	36 - 8	-		F4257
6	٠ 4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE J. A/D CONVERSION FAILURES

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FAILURE REPORT

4268

5	TECHNIC OND NUMBER DE R TECHNIC REPORT R H 3 23 G	2 GLA	1 MODEL	4 TIME OBSERVED	S. DATE 988ERVED					
	O. MANUWARE LEVEL ' CO COCCOAST	E 330 CA	SS' ABLY	1430	MO G DA X YR X					
	WHEN FAILURE STATEM		DBASSEMBLY (I MICAM	□ CARD □ PART					
	<u> </u>	MAME	PART NUMBER	S/N	MAMUFACTURER					
	7. SUBSYSYEM	······································								
	MULLIPIEXER		3533003	-100 3	HAC					
E	S ASSEMBLY . SUBASSEMBLY									
ATC	10. [] MODULE [] NISCAM [] CARD		,							
ORIGINATO	11. OTHER									
SEO.	12 TEST-WHEN GEVELOPMENT GUAL PAILURE WAS GESERVED GIN-PROCESS RACCE			LAUNCH OPERATIONS						
	13. ENVIRONMENT AMBRENT RADIA NEW WHEN FAILURE EMC/RP VIERA			THERMAL VAC						
	14 DESCRIPTION THE OF FAILURE MUSICAL CONTRACTOR C	rosa Cald	E Saile	res. se	e attached She					
L	13 TEST PROCEDURE	3.5.36 COM	auc auc	21-41	G/76 8 17 CONTINUATION					
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E	3905973 441 S/NS	32								
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SPACE AND COMMUNICATIONS GROUP

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Repair of the Multiple reasonable time for se would be as likely to The A/D conversion and by replacing hybrid mi the discrepancies are of the performance dis Thematic Mapper instru	veral reasons. The create new crossta DC Restore droop crocircuits, but the so minor that they cropancies present ment performance. RELL SYS. ENGR.	o croostal lk as to c rate discr he replace might not	le failur orroct t opancios ment par be corr	es are maight be are maight be are maight be are maight be are maight be are maight be are maintained are maint	random a nady pro not avai not avai	and repair asent. actable Llable, and ase. None
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Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

o Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

	TEMPERATURE		TO		M	FRO	
F. R. NUMBER(S)	AMB	+15°c	+50°c	SENSOR	BAND	SENSOR	BAND
F07296	x			8	1	10	1
F07296	x			12	1	14	.1
F07299, F07295, F07296	X	x	X	2	2	4	2
F07299	·	x		3	2	5	2
F07295			X	11	. 2	13	2
F07299, F07296	x	x		12	2	14	2
F4268		X		4	3 .	6	3 .
F4268				6	3	10	3
F07296	X			10	4	12	4
F4254			x	14	4	16	4
F4268, F4254, F4257	x	Z	x	4	6	1	6
F4268, F4254, F4257	X.	Z	X.	3	6	2	6
F4268, F4254, F4257	x	x	Z	1	6	3	6
F4268, F4254, F4257	X	X.	X	2	6	4	6
F4254			X	5	7	7	7
F4254			X	11	7	13	7

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

BAND	SENSOR	TEMPERATUTE	MV/SEC	F. R. NUMBER
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255
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NOTE: Spec waximum of \pm 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to \pm 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

4268

BAND	SENSOR	TEMP°C	STEP #	MAX VALUE (MV) \$ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
í	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			F4266
6 -	3	+15	193	39.1	192	-0.4	F4266
6	. 4	+15	193	39.3	192	-0.3	F4266
6	1	÷50	128	39.8	129	-0.1	F4267
6	2.	+50	128	37.0	129	-0.1	F4267
6	·3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6.	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	. 3	Ambiene	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

SANTA BARBARA RESEARCH CENTER A Subsidiery of Hughes Aircraft Company

4268

INTERNAL MEMORANDUM

TO: G. Gritt

SUBJECT: 3905973 Hybrid Crosstalk Testing

CC: L. O'Connell

DATE: 22 December 1981

REF: HS 236-2260 PE 225:81

FROM: R. Julian

41-41

BLDG. B-11 MAIL STA. 39

EXT. 6293

Two 3905973 hybrids were removed in an attempt to fix the crosstalk in Bands 2 and 7 of the S/N 3 Multiplexer. (Ref. FR No.'s F4254, F4257, and F4258). These hybrids are not being formally failure analyzed because:

- Crosstalk is caused by a combination of the hybrids and the unit wiring, and is not observable at the hybrid level.
- 2. The hybrids are tested by observing output levels with an oscilloscope. Errors of the size involved (01/2% of full scale, max.) are not visible on oscilloscopes.
- 3. The hybrids would pass all their tests and are fully functional.

In the course of hybrid repair, we will make static measurements to see whether these hybrids are abnormal in any detectable way.

Richard C. Julian REA, Multiplexer

Thematic Mapper Program

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トルド SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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7	FL EZEUNOO, CALIFORNIA I PROGRAM NAME AND NUMBER	/ 2 GLA	, 1 MODEL	4. TIME COSERVED	S. DAYE OBSERVE	
	THEMOTIC Masser	15236 F 264	FLT	1415	YR 8/ MC	1/ DA 2
	# MOW UNDER TEST SPACECRAFT SPACECRAFT WAS COSERVED SYSTEM	SUBSYSTEM C] assembly] subassembly	MICAM	CARD PART	
	EQUIPMENT IDENTIFICATION:	BMAN	PART NUMBS	SA \$/N	MARI	PACTURER .
i	a unit al. I Lipla	KER	3533003	-/on 3	1/2	·
	ASSEMBLY U SUGASSEMOLY	RER	03,33003	700 3	TA-S	
	10 MODULE I MICAM I CARD					
	TI. OTHER					
	TA TEST WHEN COVELOPMENT COVELOPMENT COSSESSIVED CONTROLS	GUALIFICATION C	INTEGRATION SYSTEM	I LALENCH OPERATIONS SPECIAL TEST		
Ì	13. ENVIRONMENT AMERICAT WHEN FAILUPE WAS DESERVED . D EMC/RR			CYCLE THERMS		A7*
	WAS DESCRIVED O EMC/RR TA DESCRIVE FAILURE, INCLUDE "IS" AND "SHOULD BE" DATA	A P P P P P	US FOR	13 Lach	_ D OTKER	e B
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	TA TEST ESTOCEDURA 32015-005	PARA - 3 10	C- FAMAU	CH4 49.41	1/- 25-	17. CONTINUATION SHEET USED
	18. VERIPICATION AND FAILURE ARALYSIS		·			
					·	
	18 FAILED IYELA	FAILED ITEM	·	S/N	MFR	жа
	NAME THE TOTAL OWING REWORKS PRETEST REQUIRED	CH YRAS	1/211			LEVEL
	ZA CI FOLLOWING REWORK/RETEST REQUIRED SECAUS	" REFER TO	124 (of That	geHEDJ	

		21. AUTHORIZATION		ORG	DATE	CONTRALATION SHEET USED
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	ACTION	VIZY TAGLE	/	32. CONTINUATION	Mon	18/11/
	ACTION REFER TO L		(CODY AND	TA CONTINUATION	A REP FA NUMBER	14/81
	ACTION REFER TO LO	70 W124	Mrg. phocedure	SHEET USED	A REP FR	11910
	34. DOCUMENT IMPLEMENTING DESIGN 28. BASIC CAUSE G DESIGN	73 W124	NEG PROCEDURE	TACHED	A REP. FA NUMGER	AROR

OF POOR QUALITY F07295 BOOM MAIN ENTE PREPARE BEQUEST FOR CEVIATION/WAIVER (328 BIL-STO-669 CD 461 FOR LESTERCTICES) 12/3/81 I. GRIGIDATOG DESE MOD ADDELSE ESA: TLE X Grisso Hughes Aircraft Co, SCG, El Segundo, California T messa ्राष्ट्राधा<u>ट</u>ी CT-ZA EVOTOLY CENTRAL EDTICE LTESS &FECTIO 4. RESIGNATION FOR CEVIATION/VALVER S. CACE LIES MITTERS b. 1970. COZZ e. EVS. DISIG. X 82577 1 450 SPECIALICATIONS AFFECTED-TEST PLAN BETTER RESIDACE 670. CE36 EPEC./GCC. ED 60. CE emio 532. C2 875783 TITLE OF CALIBITICAL CALVER Minor Performance Discrepancies, S/N 003 Multiplexer NAS 5-24200 L.I. II. ESTERATION ITES RESEASES CHILET CLASSIFICATION Multiplexer CONTIGAS O. ASCHOOLS CEVIATION Multiplexer 788 X LIVEET OF COSY/POICE Nona 18 wonths schedule slip is disapproved IN. THIER OF THIS COURSE CONTINUE TO POST TO THE WALL THE 13. CASCRIPTION OF GENTATION GAIVER The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include: o Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1. o Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2. (Continued) IA. ENDA RES ESVIAVIDADES Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance. WHICH THE ST MELEN GREET APPROVAL/OISAPPROVAL X 0=0

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Thematic Mapper Request for Deviation/Waiver W124 (Continue)

Item 23 - Description of Deviation/Waiver (Continued)

o Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system level requirement.

FRO	FROM)	TEN	TEMPERATURE		
BAND	SENSOR	BAND	SENSOR	+50°C	+15°C	AMB	F. R. NUMBER(S)
1	10	ı	8			x	F07296
1	14	1	12			Z	F07296
2	4	2	2	x	X	X	F07299, F07295, F07296
2	5	2	. 3		Z		F07299
2	13	2	11	Z			F07295
2	14	2	12		Z	X	F07299, F07296
3	6	3	- 4		X		F4268
3	10	3	6.	1			F4268
4 1	12	. 4	10			Z	F07296
4	16	4	14	X			F4254
6	1	6	4	X	X	x	F4268, F4254, F4257
6	.2	· 6	3	x	X.	X	F4268, F4254, F4257
6	3	6	1	X	X	X	F4268, F4254, F4257
6	4	. 6	2	Z	x	X	F4268, F4254, F4257
7.	7	. 7	5	X			F4254
7	13	. 7	11	x			F4254
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TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

F07295

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BAND	SENSOR	TEMPERATULE	MV/SEC	F. R. NUKBER	
1	3	Ambient	4.11	F4255	
5	6	Ambient	4.90	F4255	- 1
and the second	İ				

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

F07295

BAND	SENSOR	TEMP°C	STEP #	, MAX VALUE (MV) ≦ 31.2 MV	STEP #	MIN VALUE (MV) ≧ C.O MV	F. R. NUMBER
1	ı	+15		· · · · · · · · · · · · · · · · · · ·	32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6 :	1.	+15	193	41.7	192	-0.1	F4266
6	· 2 ·	+15	193	37.3			F4266
6	•	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6 .	1	+50	128	39.8	129	-0.1	F4267
6 -	2	+50	128	37.0	. 129	-0.1	£4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6	3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

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SPACE AND COMMUNICATIONS GROUP

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FAILURE REPORT

Nº F 07296

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SEE REVERSE SIDE OF HARD COPY FOR INSTRUCTIONS . PROGRAM NAME AND NUMBER DATE GRANNED TIME DAKEDVED 7264 THE ME FIC MUDDER

A HOW UNDER TEST OF SPACECRAFT

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USASSEMBLY MOULE CARD RESHUN TRAP MANUFACTURER EQUIPMENT IDENTIFICATION: \$/N 7. SUBSYSTEM MUL FIPLEXER Hac 2533003-100 ASSEMBLY SUBASSEMELY 10 MODULE □ HICAM □ CARD 11. STHER 12. TESY WHEN
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SPECIFICATION PROBLEM 38. BASIC CAUSE OF VERIFIED PRIMARY UNKNOWN MINOR SAFETY 37. FAILURE CRITICAL 31 FAILURE CLASSION ROLAM C 41-41 72 NI 2 FATTER NO RESERVENT

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Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

o Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplexer requirement, rather than a system livel requirement.

	<u> </u>	PERATU	TEM) ·	TO	OM	FR
F. R. NUMBER(S)	AMB	+15°c	+50°C	SENSOR	BAND	SENSOR	BAND
7296	X F			8	1	10	1
7296	X F			12	· 1	14	. 1
7299, F07295, F07296	X F	x	x	2	2	4	2
7299	F	X		3	2	5	2
7295	F	}	Z.	11	2	13	Ź
7299, F07296	X F	x		12	2	14	2
268	F	x		4	3	6	3
268	F	İ		6	3	10	3
7296	X F		5 2	10	4	12	4
254	F	·	X	14	4	16	4
268, F4254, F4257	X P	x	x	4	6 -	1 1	6
268, F\$254, P4257	X P	x .	X	3	6	2	6
268, F4254, F4257	X F	X	X	1	6	3	6
268, F4254, F4257	X F	X	Z	2	6	4	6
254	F		X	5	7	7	7
254	F		x	11	7	13	7

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: Ail channel pairs were out of specification by only one multiplexer quantization level.

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BAND	SENSOR	TEMPERATURE	MV/SEC	F. R. NUMBER	
1	3	Ambient	4.11	F4255	
5	6	Ambient	4.90	F4255	
,					

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 mv/sec.

TABLE 2. DROOP TEST FAILURES

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BAND	SENSOR	TEMP ^O C	STEP #	MAX VALUE (MV) \$ 31.2 MV	STEP #	MIN VALUE (MV) ≥ 0.0 MV	F. R. NUMBER
1	1	+15			32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	. 2	+15	193	37.3			F4266
6 ,	3	+15	193	39.1	192	-0.4	F4266
6	4	+15	193	39.3	192	-0.3	F4266
6	ì	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6 .	. 3	+50	128	36.8			F4267
6	4	÷50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6	2	Ambient	193	37.5	160	-0.5	F4265
6.	. 3	Ambient	225	35.5	224	-0.8	P4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

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FAILURE REPORT

Nº F 07299'

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ORIGINAL PAGE 19 07299 OF POOR QUALITY SECURIT FOR SEVIATION/SAIVER 12/3/81 EE4103169 X 821 560 Hughes Aircraft Co. SCG, El Segundo, California CONTICE. X anso - Carree A. BESIGNATION FOR BEVIATION/BAIVER 9. CASE LINE MESCISO COTTO INCIDENCEMICA COTTO A. C30. CER e. 276. C3810. X W124 Flight 82577 SPECIALATIONS AFFECTED. TEST PLAN G. COADIGES AFFECTES 190. COCT P(C./COC. CD. 863 1970. CG23 (2022 O ŒV. E30, t2). 4. SYSTED 6. I TO 1. TEST THE EN . 251221 25. 112 Minor Performance Discrepancies, S/N 003 Multiplexer NAS 5-24200 L.I. 32 TT. CONTINUENTION TYES BESTELL AVENT 4. ESTECT CLASSIFICATION W. 25 ਵੀ. IS CHILET Multiplexer [] ಉಪಾ **** ** **** ** ****** O. CIQUESTOS GIVIASTOSFOSTOS Multiplexer 80% X M. WHET AS EDST/POICE IV. BUTTER ES LES TESTES None 18 months schedule slip is disapproved TITLE TO THE COUNTY DESIGNED TO THE REAL STY. 13. ESSEDIPTION OF DEVIATION CALVED The S/N 003 Multiplexer (P/N 3533003-100) exhibits minor performance discrepancies in its processing of some of its 100 signal channels. These discrepancies result from random wire dressing and other phenomena which are not correctable, and they do not have any impact upon Thematic Mapper performance. These discrepancies include: o Sixteen channels exhibit levels of crosstalk to other channels slightly exceeding specification. They are listed in Table 1. o Two channels exhibit levels of DC Restore droop slightly higher than specified at room temperature. They are listed in Table 2. (Continued) 16. MILD TOO SEVIATION GAINED Repair of the Multiplexer to correct these discrepancies is not practical within a reasonable time for several reasons. The crosstalk failures are random and repair would be as likely to create new crosstalk as to correct that already present. The A/D conversion and DC Restore droop rate discrepancies might be correctable by replacing hybrid microcircuits, but the replacement parts are not available, and the discrepancies are so minor that they might not be corrected in any case. None of the performance discrepancies present will have a detectable effect upon Thematic Mapper instrument performance. II. MESOCIOS CINCTIVINO CO MAIS SEES TI CONTRACT PEOVAL / DISAPPROVAL X commen MPCOPA OF CHARGE B1 SACPROVED

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Thematic Mapper Request for Deviation/Waiver W124 (Continued)

Item 23 - Description of Deviation/Waiver (Continued)

o Six channels exhibit one A/D conversion step which exceeds the specified maximum of 31.2 millivolts and/or is less than the specified minimum of zero millivolts in size. No sensor exhibits more than one step which is too large and one which is too small. The sensors and corresponding Failure Reports are listed in Table 3. In all cases the discrepant conversion step does not cause the RMS noise of the sensor channel to exceed specified values, and therefore the discrepancies will not appreciably affect Instrument performance. The minimum and maximum step sizes are a self-imposed Multiplemer requirement, rather than a system level requirement.

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	RE	PEPATU	TEM		TO	M	FRO
F. R. NUMBER(S)	AMB	+15°C	+50°C	SENSOR	BAND	SENSOR	BAND
F07296	x			. 8	1	10	1
F07296	x			12	1	14	1
F07299, F07295, F07296	×.	. x .	x	2	2.	4	2
F07299	,	x		3 -	2	5	2 .
F07295			×	11	2	13	2
F07299, F07296	x	X ·		12	2	14	2
F4268	1	X		4	3	6	3 .
F4268		,		6	3	10	3
F07296	x	·		10	4	12	4
74254			X	14	4	16	4
F4268, F4254, F4257	x	x	x	4	6	1	6
F4268, F4254, F4257	x	X.	X	3	6	2	6
F4268, F4254, F4257	Z	X	X	1	6	3	6
F4268, F4254, F4257	x	x	x	2	6	4	6
F4254			X	5	7	7	7
F4254			X	11	7	13	7

TABLE 1. MULTIPLEXER S/N 003 CROSSTALK

NOTE: All_channel pairs were out of specification by only one multiplexer quantization level.

BAND	SENSOR	TEMPERATULE	MV/SEC	f. R. NUMBER
	3 3			
1	3	Ambient	4.11	F4255
5	6	Ambient	4.90	F4255
j l		· .		

NOTE: Spec maximum of ± 3 mv/sec is a self-imposed specification. Instrument error budgets would allow rate up to ± 120 my/sec.

TABLE 2. DROOP TEST FAILURES

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BAND	SENSOR	TEMP ^O C	STEP #	MAX VALUE (MV) ≦ 31.2 MV	STEP	MIN VALUE (MV) # ≥ 0.0 MV	F. R. NUMBER
		. · · · ·			, 		
1	1	+15		3.3	32	-0.8	F4266
7	13	+15			241	-0.4	F4266
6	1	+15	193	41.7	192	-0.1	F4266
6	2	+15	193	37.3			P4266
6	3	+15	193	39.1	192	-0.4	F4266
6	. 4	+15	193	39.3	192	-0.3	P4266
6	1	+50	128	39.8	129	-0.1	F4267
6	2	+50	128	37.0	129	-0.1	F4267
6	3	+50	128	36.8			F4267
6	4	+50	128	36.8	192	-0.1	F4267
6	1	Ambient	193	39.4	160	-0.1	F4265
6.	2	Ambient	193	37.5	160	-0.5	F4265
6	. 3	Ambient	225	35.5	224	-0.8	F4265
6	4	Ambient	193	39.6	232	-0.2	F4265

TABLE 3. A/D CONVERSION FAILURES

SECTION 2.2 SCAN MIRNOR ASSEMBLE

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Section 2.2.1

Scan Mirror Assembly

Performance Data

The acceptance performance (test) data for the Scan Mirror Assembly is contained in Appendix B (Vol. IV, part B).

2.2.2
Acceptance Data

2.2.2.1 Configuration Lists

P/N 3533002-100

THEMATIC MAPPER

SCAN MIRROR ASSEMBLY SERIAL NO. 004

P	S DES	IGNED		AS	BUILT .
SOCUMENT NO.	REV.	SUPPLEMENTARY DOCUMENTS	DOCUMENT	REV.	SUPPLEMENTARY . DOCUMENTS
3533002-100	Ď	W020 E0 64358 E0 13113 E0 64363 E0 64374 E0 64369	3533002-100	D	W020 EO 64358 EO 13113 EO 64363 EO 64374 EO 64369
TS 32015-004	В	E0 13100 E0 64391 E0 13111 E0 64385 E0 64394 E0 13112 E0 64379 E0 13105	TS 32015-004	8	EO 13100 EO 64391 EO 13111 EO 64385 EO 64394 EO 13112 EO 64379 EO 13105
3568874	8	EO 70667 EO 70504 EO 64304 EO 70565 EO 70614 EO 70583 EO 64371	3568874	В	EO 70667 EO 70504 EO 70565 EO 70614 EO 70583
3568900	С	EO 70693	3568900	С	EO 70693
3568899-2	В	W062 W044 E0 64392	3568899-2	В	W062 W044 E0 64392
3568911	В	EO 64344 EO 70672	3568911	В	EO 64344 EO 70672
3568909	A		3568909	A	•
3568970 B	A	EO 64322 EO 64330 EO 64317 EO 64314	3568970	A	EO 64322 EO 64330 EO 64317 EO 64314

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4/22/81

P/N 3533002-100

THEMATIC MAPPER

SCAN MIRROR ASSEMBLY SERIAL NO. 004

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AS	DES	GNED		AS	BUILT
OCUMENT NO.	REV.	SUPPLEMENTARY DOCUMENTS	DOCUMENT	RFV.	SUPPLEMENTARY DOCUMENTS
568972	F	W070	3568972	E	W070 E0 64335 E0 64360 E0 64352
					EO 64329 EO 64323 EO 64318
\$68980	D	D009 D020 D024	3568980	С	DC09 D020 D024 E0 64350 E0 70677 E0 64341 E0 64302 E0 64339 E0 64328
568995	N/C	EO 70482 EO 70546 EO 70577 EO 70615	3568995	N/C	EO 70482 EO 70546 EO 70615 EO 70577
568980 IFFILE AS HEYO	D	D009 D020 D024	3568980	С	D009 D020 D024 E0 64350 E0 70677 E0 64341 E0 64302 E0 64339 E0 64328 E0 64356
1568995 SAME: AL ABOTE	N/C	EO 70482 EO 70546 EO 70577 EO 70615	3568995	N/C	EO 70482 EO 70546 EO 70615 EO 70577

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PAGE 3 OF 4

THEMATIC MAPPER

SCAN MIRROR ASSEMBLY SERIAL NO. 004

AS DESIGNED			AS BUILT		
C DOCUMENT NO.	REV.	SUPPLEMENTARY DOCUMENTS	DOCUMENT	REV.	SUPPLEMENTARY DOCUMENTS
3568985	Ε	D011 D019 D023 E0 64337 E0 64342	3568985	E	D011 D019 D023 EO 64337 EO 64342
3568997	N/C	EO 70406 EO 70483	3568997	N/C	EO 70406 EO 70483
3568985-1	Ε	D011 D019 D023 E0 64337 E0 64342	3568985-1 }	Ε	D011 D019 D023 EO 64337 EO 64342
3508997 Shive As Alson	N/C	EO 70406 EO 70483	3568997	N/C	EO 70406 EO 70483
3568990 ()	D	D029 D017 E0 64355 E0 70684 E0 64319	3568990	D	D029 E0 64355 E0 70684 E0 64319
3569087 Č	N/C	EO 64311 EO 64359 EO 64347	3569087	N/C	EO 64311 EO 64359 EO 64308 EO 64347
3569000 E:	D	W070 E0 70646 E0 70679 E0 64357	3569000	D	W070 E0 70646 E0 70679 E0 64357
,3569018 C	В	EO 70587 EO 64354 EO 64862- EO 64361	3569018	В	EO 70587 EO 64354 EO 64361
		1 1			

ATE: 4/22/81

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والمنافئة والمنافعة والمنافظ والمنطقين والأمالة والمسافيين وكالا المنافع والمناف المنافعة والمنافعة والماكات

PAGE 4 OF 4

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THEMATIC MAPPER

SCAN HIRROR ASSEMBLY SERIAL NO. 004

AS DESIGNED AS BUILT SUPPLEMENTARY SUPPLEMENTARY DOCUMENT REV. REV DOCUMENT NO. DOCUMENTS DOCUMENTS С B0008 3569010 3569010 C D0008 EO 70622 EO 70662 N/C EO 70336 3569093 N/C 3569093 EO 70336 B0008 3569010 C 3569010 B0008 EO 7.0622. EO 70622 Some as Above N/C EO 70336 3569093 N/C 3569093 EO 70336 SAME AS ABOUT 3569050-1 EO 64332 3569050-1 EO 64332 -EO 64332 9050-2 A 3569050-2 EO 64332 3569062-1 Α N/C EO 70606 3 3062-1 EO 70551 EO 70434 EO 70564 EO 70553 A 3569062-2 N/C 3569062-2 EO 70551 EO 70606 EO 70553 EO 70434 EO 70564 EO 70391 N/C 3569083 N/C 3569083 EO 70391 EO 70397 EO 70397 EO 64346 EO 70521 EO 70521 3569114 EO 64345 EO 64345 3569114 D. 3569019 3569019 C EO 70568 EO 70575 : :1

R. L. COOK, MANAGER

QUALITY ASSURANCE ENGINEER

SCAN MIRROR ASSEMBLY

Listing of Liens

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SCAN MIRROR ASSEMBLY

P/N 353302-100

FLIGHT

Failure Report No. Open Closed F0170* F1302 F1305 F1306 F1307 F1308 F1322 F1325 F1327 F1328 F1329 F1330 F1342 F1352 F1353 S8392 S8116 S8369

Deviations	Waivers
	·
	W-121
1	

^{*} Spare

SCAN MIRROR ASSY.

P/N 3533002

PROTOFLIGHT ()FLIGHT ENGINEER LTM Failure Report Failure Report Failure Report Failure Report Open Closed Closed Closed Closed Open Open Open F0170 Spare F1302 F0161 F1317 A0028 F1305 F1304 F1318 0800A F1306 F1344 A0081 F1309 F1307 F1345 F1310 A0082 F1308 F1350 A0083 F1313 F1322 F1354 F0502 F1314 F1325 F2642 F0503 F1315 F1327 F2691 F0701 F1316 F1328 F2739. F0702 F1320 F1329 **S8092** F1301 F1323 F1330 **S8300** F1312 F1342 F1343 F1352 F1351 F1353 S8116 S8369 S8392

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HUGHES

SPACE AND COMMUNICATION GROUP FAILURE REPORT

H	ÜĈ	MES AIRCRAFT COMP		•	AILURE	REPO	·		1302
Γ	T	T PROGRAM WANT / 5	36 HAPPE	TIC 2 GLA	3.	- J. J.	OESERVED 1300	S. OATE GREENVER	Ğ 28 79
		& HARCHARG LEVEL WHEN FAILURE WAS OBSERVED	DACECHA DESTEN		SUBSYSTEM UNIT	DIS VETENOTA		(CARO PART
	F	FOURMENT IDENTIFICATION	2 - 7 /		MAME		PART NUMBER	\$79	MANFUACTUIN
1	1	1. SUBSYSTEM .353	3002 - 10	<u>აი </u>	MA	353	33002-100	∞ EM	
	ŀ		SASSONELY 7	ORQUER	ASSY	35	68911	4563	
	,	10 10 woons 1 wich		S. C. C. C.			, care	1, 4, 24, -2.	
		11.0THER SUBASSE	MBCV: Hous	SING ASSY	- TORQUER	350	68909	3,456	
18	3	17. TEST WHEN PAILURE WAS ORDERVED	DSVELOPMENT IN-MOCRES		OUALIFICATION ACCEPTANCE		TEGRATION PETEM	- LAURON O	PERATIONS
		13 ENVIRONMENT WASHING AND WASHING DESCRIPTION OF THE PROPERTY	STO AMERICAT (RADIATION	TEMPERATUR ANIS FOR	4	THERMAL VAC		
		14 DESCRIPTION TER	MINALS 6	:5 E1.	E4 E8	ARE A	IT MARKED	AS PE	R
۱		DRAW	ING 350	48902					
١		IS TEST PROCEDURE	,	ARA ILC	DEGINATOR AG.	HOLER	CAC	7119/29	CONTINUATION
-	1	TE VARIFICATION AND FAILURE ANALYSIS	VISUAL I	SIECTION		ورباك فجب وبنجيب الأمال السيد	28 115 135	7114/29	1-21.0320
١,	.		VISUAL IN	<u> </u>	, 49321,19	· DISC	REPANCY		·
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- Inches			REMARK	TERM	LNASS	PER	PRINT		
3							,		
				21	MOHASHOHTUA		0яв -	DATE	CONTINUATION THE TUSED
Γ		Z) REMORK/RETTET S	/N CO3,0	OK AND	005 WER	E REWO	RKED TO PR	NT OCH	
		ATTACHED). <u>s/w 6</u>	WAS U	SED IN E	MINEER	CER MADEL		178
	1			····		·		***************************************	N CA THE
	}	20. LIST ALL PARTS REPLACED		•					
	1	●点の子 80,200分類	CET SYM	PART LOT NO.	DATE CODS	, mu	PROSABLE DEFE	-	ANALYSIS NO.
	1	· · · · · · · · · · · · · · · · · · ·		1					
'	1								
		27. REWORK BY	. 0	MG DATE	28 78 TES	TEO	one i	JATE 1	CONTINUATION
Γ	1	SO, CAUSE AND CORRECTIVE	WORKMAN	USHAP B	ERAR.				
	ļ		TECHNIC	1425	AND QA	PERAD	WHEL WER	***	
	ļ	ADVISED	TO USE				TERMINAGS	77.180 CT	OSURE
١,	. }	AND IN	SPECT!	20 19	FREING	<u> </u>			1-
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Camba ta har of y	1		······································	· · · · · · · · · · · · · · · · · · ·	·		21 CONTINUE	Tion I	18 111
ې د	:	33.DOCUMENT IMPLEMENTING CORRECTIVE ACTION)				THE SHEET US		7/11/
_ `L	۱,	14 BASIC CAUSE OF VERIFIED FAILURE	DESIGN		TEST FOOL	LLEG. PROC		INDENDE	DOPECT COOR
1.3	L	! !	DIFFECTIVE	PARTS -	7287 SET UP	CA MORKWAY	SHARE CO	at "	
1		AL PAULUME CONTRACTOR	_	UNKNOWN		SE FAILURE CLASSIFICATI	CROTTLEAL		LTY
	-	11 RESPONSES 1917	Min. 10	300	DATE	TE GATICEAST	11000	0°G	- OATLO / /A d

HUGHES

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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Γ	1. PROGRAM HAME	36. TM	12 GLA E 331.	3. 4000EL A	-/ 4 Time	AVO 16-30	S. DATE	7 2	7 70
ŀ	& HARCHARS LEVEL	- SPACEGRAFT	SUBSYSTEM		EM9LY	WODULE	C	CARD	
İ	MAE OSCHRUD	MALEAS	UNIT UNIT	No	ASSEMBLY	EXCVID		PART	
1	EQUIPMENT IDENTIFICATION:		MAME		PART	NESS A	S/N	SAMPUA	CTUER
	7. SUESYSTEM	·							
1	& UMIT 1								
ľ	& DASSEMBLY DOUB	ASSENCE /1,//	LER		35668	(4 8	سن		
8	10. MICOULE MICA	. CARD							
¥	11.0THER	н ,							
8	12 TEST WHEN FAILURE WAS GENERATED	OSVGLOPHENT IN-FROCRESS	GUALIFICATION ACCEPTANCE	; (INTEGRATION SYSTEM		Da Perce	To Aco	FREE
	13 ENVIRONIGNT WHEN FAILURE WAS OCCERVED	AMEIERT RADIA			* TVPQ _	THERESAL VAC.	HRE.		
	14 DESCRIPTION A	10. Diamin	EN REAR	C	LIFTA		ers: N	· · · · · · · · · · · · · · · · · · ·	
	(1- 12		, and , and	- 11 1 a			CALL TO	BARKA	
١.	- Châl	AF TITLE	ATEDER NO	TAN JUA	JUR 147	<u> </u>		*******	
	16 7557	PARA	IG ORIGINATOR			CRO	DATE	e 12-ce	MINUATION
_	18. TEST PROCEDURG		E	16 /70	ESETT	10R-4	< 17/20/	25/	MARY USED
1	PAILURE ANALYSIS	CTUALLY ON	in Our L	uppaa_	APRA A	VEAR		*********	
n	COA	MAR CUBEL	lar-R-						
MILE									
1				19 FAILED	ITEM NAME	1:0000	0/11200	سربرسرسر د درویسر مرح م	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
9	ZA THE FOLLOWING REPORTED HO	COSTEST REQUIRED		ANSPA	AT NUMBER /:	1. 0 4. 5 2	1-180 336	T X II	-
1	ON TEST SELECTION OF THE						-	-	
3	12/10	RER Will- 1	SE RETURN	ão Tc	Sanga	Fee	FWCKE	ACT	
3	LICEC	JEBI PAL	SASER T	EP 51	352)			,	
			ZI.AUTKOZIZONI	XII.		177-1	DATE /		MOST AUGUSTON
	ZE ROWDERN RETURN ACTION TAKEN	ENDOR TO	STRIP RRI	olari 6	E RECOLL	74	1 1 1 2 1 1 1		100 h
=	Reman	702 Kb7+20cm B	en let R B	200795-	REPLA	<u> </u>	BURLU		8
2	RE THE DAY	ALCEPTIONS	5 -11	2/2	-			29:	30
1			MIC	The state of the s		•			P. J.
Į	22 LIST ALL PARTS REPLACED PART MUSICER	CKTSYH PAR	RT LOT NO. DATE CO	05 l wea		PROBABLE CEPEC	-	AMALYE	6.00
Į				<u> </u>		-worker cerec	·	NAME TO	
(§									
1 1									
	22 400000	250	OATE 728			CRG	CATE	· 8 -	Author ander
	27. HOWDERK GY		1 3	ETESTEO Y				<u> </u>	NTINUATION LEET USED
	10 CAUSE AND CORRECTIVE ACTION	IMPROPER C	LEANING B.	VENE	OR.			***************************************	
l									
1	RETURN	TO VENDOR	REF.	NCM	R 316	897	13. FR8 CL	SAVE	
1				***********			_		1
2	C 22.	7		· · · · · ·	12001			ı۸	161
1	SUPPLIER	CARRECTURE F	HOTOL NEAR		53871	_102AS_		` کړ	1/1/
13	SENT TO V	enior in	ACCORDANCE	WITH	HISILA	2 Milan		A 13	10/A
5	Co. Surruse	COARCOUR	JETRAN !	JULY H	<u></u>	SHEET USE		Pal	\
1	32 DOCUMENT IMPLEMENTING CORRECTIVE ACTION	NCMIZ 316	397					' \	
ENGINELHINGFIELIABILITY	JA BASIC CAUSE OF VERIFIED FAILURE	OESIGN	TEST ROUIP.		G. PROCEDUR€	MIRDEG &	11 =	UNXMOWN	
13	FAILURE	DEPECTIVE PARTS	TEST PROC.		TY/FAB ERROR RKMANSHIP	CONTRACTOR WA		GEFECT CODE	
!	IS FAILURE PRI				AR BEICATION	CRITICAL	- MINC)A	
		UCED 180 HOFA	HLUME	SLASS	La sill	25 WARF	2 340		
	THE MASIBLE CO	narshart 177	-15 OATE/2-3-	SO SE SPACECH	AST X	Lew lost	22-1°C	of SATE	2/11/80
	39.RELIABILITY	090		40.CUSTOME				DATE	

DUPLICATE

HUGHES HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT



_	1. PROGRAM HAMES TM HS-236 2. GLA E330 2. ECOCCL FLT 4. TIME CONCL.	VEO S. DATE CEZERVED 10	91 2047 Q YA
	A MAGENARY I PURE TO PROCEED TO THE PURE TO A MAGENARY	MODULE MODULE	
	MAGO CESCONOS SYSTEM UNIT SUB-CESCOLY		PART
	EQUIPMENT IQUITIFICATION: NAME PART NO	보면A 5/N	MANUFACTURER
1	1. 110071709		
	S. M. A. 3533002-	100	HAC
	# VESCHOLY SNEWGORDLY		
8	g 10 C MODULE C MICAM CECARD 35689	35 007	HAC
ORIGHATOR	\$ 11.0THGR		-
Š	5 12 TEST YOMEN OCUSEONEST OMALIFICATION INTEGRALYION OCCUPANCE SYSTEM	C COMICS OF CRA	TIONS
	13. ENVIRONMENT AMBIENT ANDIATION TEMPERATURE	TREERINAL'VAC HRS. AT _	
1	West AR2 rotates counter-clockviss. ART wes on Re	g assembly dr	awing
	ambiguous. work	4	
1		10/10/	79
	14 TEST TS32015-006 'ARA4.8 LORIGIALITO Warren Hayden	0809 0.0 0000	17 CONTINUATION
-			
	FAILURE ANALYSIS -24vdc voltage adjustment faulty, due to		
3	AR2. Other than AR2, no parts were stressed. Po	wer supply was	CALLARE
3	limited a 30 ma.	······	المنبول الشاف ويست المريب سنسنب من
N S	BEAN WEST DESIGNATION OF THE SERVICE		
ENGINE CRING EVALUATION	2 CO FOLLOWING REPORMINETEST REQUIRED Replace AR2/Retest		
MEC			
3	18	10/12	779
-	21.Au Tegalization Hayden	°,17-35-72	CONTINUATION
-	73 Girc/Syrpston	121-33 44	23-70-20
1	ACTION TAREN RemovedAR2		——————————————————————————————————————
15			J6
18	Replaced E/R 10/22/79	 	A SET STAC
MANUFACTURING AND TEST	Retested 10/30/79 (mil	, , , , , , , , , , , , , , , , , , , 	
E	FART HUMBER CHT SYM FART (OT NO. DATE CODE MER	PROBABLE DEPECT	AMALYSIS NO.
15	2 908950-1 AR 2 90892-501M		
3			
3			
1	27. ASWORK # 5 00097-55 0ATE 1/0/19/79 TO PETERSTON	ORD 77-32-121	CONTINUATION SHEET USED
	30 CAUSE AND CORRECTIVE ACTION		
	Drawing was not clear.	13, FRO CLOSUR	4
	Dwg Changed - See BCR 973587 Revision		
>		2	:
1			
1	[5	11 ACUTINIA TON	
Ş		DISET USED	
5	12.DOCUMENT HONESMENTING CORRECTIVE ACTION FCR 873 583 Key- Dielegrid 1/18/8/		
ENGINE ERING/RELIABLITY	34. BASIC CAUSE OF VERIFIED OF VERIFIED FAILURE OF VERIFIED OF VER		UNKNOWN ECT COOS
=	OBFECTIVE PARTS TEST SET-UP WORKMANSHIP	- WEAR-OUT	
	JE FAILURE DIRECTION JE FAILURE CLASSIFICATION CONTROLLED INDUCED NO FAILURE	CRITICAL SEE MINOR	
	27. RESPONSING - BYLL ON ORG 7-52-11/0/16/80 DESPACECRAFT 11. 14.	+ remoder 122-61	3ATE 11/21/80
1	39, RELIABELITY (PULL) PRO 57 44 DATE 11-12-80 SUPPLIER OR S.B.		DATE

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1419/21

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DUPLICATE
SPACE AND COMMUNICATION GROUP
FAILLIPE REPORT

		•
Γ	1. PROGRAM MANA H3-236 (TM) 2 at 2330 NS236TM 1 The PROGRAM TO 12710	779**
	A HARITMANS LEVEL DACESTARY DESCRIPTION ANSWERS CONTROLL CARROLL	
ŀ	WAS CARRIED STATES UNIT CHARGES IN MANUEL IN M	
	ECLIPTENT CONTINUES IN MANUS 1. SUCCESTED	ACTURER
:	e unit	
	Scan Mirror Aggy [35 33002=103] , RAC	<u></u>
5	I TO D HOOME D HICK: D CARO	
į	11.07×63	
8	8 12.T.IST WINTERNATION INTERNATION CONTENTS CON	
]	TABORDO TO THE PAILURG THE PAI	•
		L-E91.
	(2) P3-8 has the wire that should be connected to P3-F P3-6 should	
l		isolate
L	10 TEST AND TS 32015-006 AND 4.4 10 OFFICE W. Hayden 00077-35-22 12/10/1	CLEU TOBKE
	PALLED ARALYSIS TO DAWN US A Called three day may appear them	^
_	Secured Secured	Z
1		
1	TO AND TO	
2	2 EX (22) POLICIPACE REPORT REQUIRED RECORDER REPORT REQUIRED RECORDER REPORT REQUIRED (SCALE) RECORDER REPORT REQUIRED (SCALE) RECORDER REPORT REQUIRED (SCALE) RECORDER REPORT REQUIRED (SCALE)	
METARES BVALUE	Forward a description of all rework action to	reat
3	to determine if complete/partial retest is required.	
3	12/10/79	
	21. Hayden 777-35-272 E	SHEET LEUR
	ZLECTOR PRETENT (1) J2 22 Wired to E3/Replaced J2-22 Wire	Second
_	(2) Switched P38 wire to P3+9 (3) Item 13 was shorted to Item 26.	(IP)
E	Replaced Item 33. Amount 1945 + I have 155	L CATEGO
¥	PETET SUCCESSAL TO TS 32015-006.	(\cdot,\cdot)
18	PALLET ALL PARTY REPLACED	
Ę	PART HUMBER CRT TYM PART LOT NO. DATE CODE MER PROGRAFULTERECT AMALY	DO ROT
3		
3		
l	77-551 12/13/79 Tean Heider 080 77-551 12/13/79 TESTED / S Hayden 177-39-12/2	HOIT LUNTHOO
<u> </u>	Jean Heider. 177-55112/13/75	SHEET USED
i .	1/25/80	
	Workmanship	
1	Assembler has been cautioned to use extreme care when	
ı	performing the wiring operation.	
MELLITY		`
1		1 1/
3	21. CONTINUATION WILLIAMS SHEEDTIVESOD	26 01
1	22.DOCUMBITT INDICEMENTING Verbal	
* MGINE ERINGINE	DA BASIC CAUSS DO GRIGHED DA VERIFIED DA VERIFIED DA SET/FAB ERROR ROCIGH HANDLING DEST PROC. D	
ž	ENVIRONMENTAL TEST PROC. ASSY/FAS ERROR CULION HANDLAND OFFECT CUDE DEFECTIVE PARTS TEST SET-UP WORMANDHIP WEJAR-CUT	
	28 FAILURE PRIMARY UNKNOWN JE FAILURE CASSIFICATION CRITETIAL MINOR	
	MODULED MOPAILLINE 110 PANCEY	1-1-
1	EMBINEER IL /Am CL 721/1-12 11/29/80 SYSTEM ENGAL THE STATE OF THE STA	1/11/83
	JERELIACILITY / JAG / / / OATE, / OATE,	• •

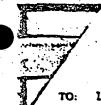
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SPACE AND COMMUNICATION GROUP FAILURE REPORT

Г	٦	MT RESHUNGAA	HS-236	1 am E330	3. MODEL F	LT '	CESERVED	A DATE OSTERVED	10%31979**
		MARCHARD LEVEL WISH PAILUIS OF PRESSO BAN	- SACECHART	SUESYSTEM UNIT	=	GENSLY JOACSENGLY	MICHM MODULE	Č	CARO PART
1.		ROUNNEHT IDENTIFICATION: 1. BJEZYETEM		PMAP			PART NUMBER	8/N	MANUPACTURER
1	ŀ			SMA		26220	02-100		HAC
i	ì	& UNIT							
	١		BAESEMOLY	SME		35689			HAC
8		10 C MOON'S C MICY	M XX cuso Elac	t.Comp.Assy.		35689	90	008	HAC
13		II.OTHER							
8		12 TEET WHEN FAILURE MAE OCCERVED	INNUCCEES CONTRACTOR	GUALIFICATIO	*	INTEGR			erandus
		TARENTA AND AND AND AND AND AND AND AND AND AN		ADIATION TEMPER		Alm L	THERMAL VAC.		AГ
1	l	14 OFFERINTION CR38			4.1, 3)		st failed.	E78 me	asured
1	·	5.6v instea	d of 0v ind	licating CR38	polari	ty re	versed.		
1	I								79
-	ſ	* MOCEDURE TS 32	015-006 "ARA	. 1 IS ORIGINATORY.	Hayden	\ \	OP177-3	5 3415.0/3	1/86 COSTINUATION
Г	٦	PAILURE ANALYSIS		•					
1_	ŀ		RZBA	الملاء ملاء	a na 7	~ × · +	4 4125	V 00 1100	rsed
13	1	1020 -41	1	# 4	7 40 L	11	7 11 1 1	11 1	1 10 00 1 .
\$	-	CX30 offers	sup rock	ar to be and	1217 12	- (<u>)</u>	Menty	ideat of	1 CE TR Design
١	١	severand to the	block often	to such all I	LOUIS	BHAM MUTIO	. ,		<u> </u>
. Petro		AGMONTAGE REPORT	ZINASES GENERALIZA	- (4 R	FF. IDC		36-7717 7		S PSYALYSIS.
Elizane i		Reg	noire on	d revers	00	R 3 8	7.	Brown !	ヤイプドキルニカン
3	ſ	· D	- test	·					
-	Ī		مساهما استكامه إسيكام اسر	HOGIASHIOHTMA.EL	vden		°77-35	°¥0/31	/79 TA COMMINATION
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SANTA BARBARA RESEARCH CENTER A Subsidiery of Maghin Associate Company

F 1308

INTERNAL MEMORANDUM

ro: L. O'Connell

C: Altman, L. Barnett, G.C. Day, J.G. Data Bank

REF: HS236-7717 REAH 81/60

SUBJECT: FR: F1308
(SMR Interface F

(SME Interface Bd, 3568990, Flt)

FROM: A. Huber

BI.DC. B-11 MAIL STA. 102

DATE: 13 November 1981

EXT. 6246

FR: F1308, dated 10/31/79

The failure was encountered during board test of the scan mirror electronics interface board (assy. no. 3568990) and consisted of an improperly installed diode (CR38 installed with reverse polarity). Figure 1 illustrates the circuit which utilizes CR38. With CR38 installed backwards it was not possible to generate +5VDC logic power via relay K2. The diode was subsequently reinstalled with correct polarity. No overstress to interface board circuitry occurred as a result of the absence of +5VDC power.

A Fuher E Huber

AH:jc

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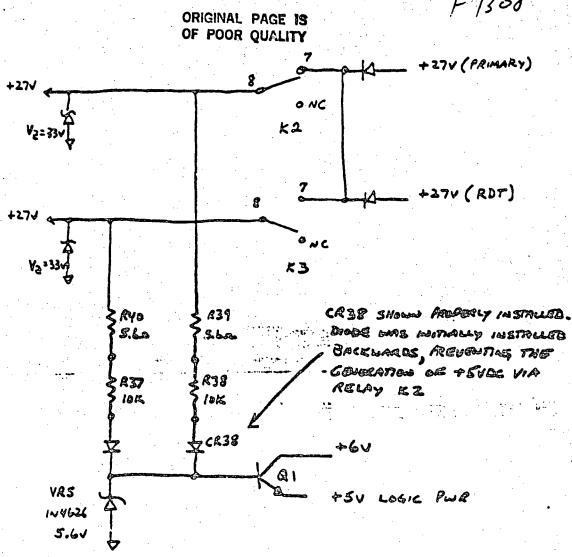


FIGURE SME INTERFACE BUARD CIRCUITRY FOR GENERATION OF +5VDG LOGIC POWER

TFR 1308

CORRECTIVE ACTION REQUEST

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An investigation into this problem indicates that this was an oversight by both the Manufacturing operator and the QA inspector. Discussion with all inspection personnel has assured me they are aware of the requirement to review component polarity, component placement, component value, and workmanship during inspection operations. Therefore this is a random error.

NOTE:

Although the failure was detected by test personnel on 10-31-79, neither Manufacturing supervisor nor the operator were contacted until 1-28-80, at which time Q.A. requested Corrective Action. Q.A. was not notified of the error until 1-14-80.

REMEDY

- Manufacturing supervision and operator were notified of discrepancy on 1-28-80.
- b) A review of the affected drawing and planning was performed on 1-28-80. These documents were found to be adequate and did not contribute to the problem.
- c) The inspector assigned to the program was cautioned on 1-28-80, to exercise more care during future inspections.

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SANTA BARBARA RESEARCH CENTER A Subsidiery of Hughes Aircreft Company INTERNAL MEMORANDUM

TO: G. Gaudette

C: A.B. Marchant

DATE: 8 February 1982

BEF: HS 236-7830 PE 21:82 FROM A. Perline

SUBJECT: Equipment Usage Suspension for Scan Mirror Assembly DAS

Test Set.

EXT. 6106

BLDG. B-11 MAILSTA 39

- 1. Failure Report F1325 documents an SMA discrepancy that was discovered on 2 Pebruary 1981. The cause of this discrepancy was traced to the DAS used for testing the SMA.
- 2. The DAS will not be repaired unless there is seem follow-up work on the Thomatic Mapper.
- 3. It is necessary to preclude any possible future utilization of the DAS prior to repair. Therefore, you are requested to affix a red "equipment usage suspension" tag to the DAS with an emplanation that resintenance is required prior to use.

AP:jc

Attachments: Failure Report F1325

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Hughes

SPACE AND COMMUNICATION GROUP FAILURE REPORT

F 1327

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INTERDEPARTMENTAL CORRESPONDENCE

TO: B. Marchant

cc: HS 236 Distribution

DATE: February 20 1981 REF. 7731.1/2043

ORG:

HS 23

HS 236-2043

SUBJECT: F-1 SMA Re-entry into the Acceptance Test

FROM: Nick J. Constantinides org. 77-31-11

BLDG. 5

MAIL STA B146 EXT. 7601

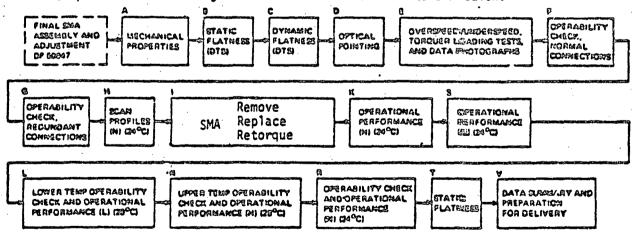
On February 4th the F-1 Scan Mirror Assembly Acceptance Test was interrupted. A penalty Acceptance Test was introduced so that a SAM Offset Angle variation and a pointing angle discrepancy be investigated. This investigation was completed on February 19th.

An IDC on pertinent information and findings resulting from this investigation will be published at a later time.

On February 20th, the F-1 SMA is scheduled to re-enter the Acceptance Test.

The reduced data, and the aforementioned investigation was conclussive of the fact that both SAM Offset and Pointing angle discrepancy were not related to the SMA's thermal and/or vibrational test.

For this reason the recommandation is made that the F-1 SMA re-enters the Acceptance Test starting with Test Flow Event "H" as shown below.



(M) OVERALL IN, N, LI INPUT VOLTAGES, HIGH, KOMINAL, LOW DTB • DEVELOPMENT TEST STATION

F-1 SMA Test Flow Event Sequence.

Test flow event I was Vibration and Thermal Cycle. It has been changed to a test that consists of removing and replacing the SIA on the TDS fixture.

It is to be noted that a new scan profile baseline is established by a re-run of Test Flow Event "H" which incorporates new, corrected values for Scan Mirror pointing angles.

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SANTA BARBARA RESEARCH CENTER A Subsidiary of Mughas Aircreft Company

F 1327

INTERNAL MEMORANDUM

TO: J. L. Engel

CC: Distribution

DATE: 1 April 1981

REF: HS236-7381

EDOM:

FROM: W. H. Fraudenstein

MAIL STA. 79

BLDG. 774 EXT. 4132

SUBJECT: F-1 Scan Mirror Acceptance Test Data

SUMMARY

The test data for the Flight One Model of the Thematic Mapper Scan Mirror Assembly was reviewed on 13 March 1981. The performance of the assembly as validated by the test record is excellent. The turn around time specification is exceeded. This does not pose a problem to system performance at the levels measured.

DISCUSSION

The acceptance test data for the F-1 SMA is summarized in Table I. The scan profile data is excellent and meets the required specifications in all cases. A special procedure was employed for this unit to provide a calibration profile at the end (in addition to the beginning) of the acceptance test sequence. This data showed a maximum nonlinearity of 9.9 urad along scan and -1.7 urad cross scan. The maximum band-to-band misregistration was determined at this point to be 7.044% compared to a specification of 0.094%. The maximum overlap/underlap is 1.23 urad against a requirement of 2.1 urad. Along and cross-scan geometric repeatability met specification as did line length repeatability and scan rate.

The specification for turnaround time imposed by the SMA specification had been tightened since the test of the Protoflight unit. The specification for turnaround time imposed on the Flight One SMA was 10590 <u>c</u> 68 µsec. This specification was exceeded in four instances, in the worst case by 13.2 µsec at 10670.2 µsec. That number indicates an out of specification condition as far as the SMA spec is concerned. It does not represent an out of spec condition at the system level. One value of turnaround (SAM 2, turnaround 8) is out of spec both with regard to the SMA spec and the system spec of 10.515 msec as compared to a system spec of 10.521 msec. Analysis of the impact of this condition indicates a minimal impact on overlap/underlap. No other system level specifications are impacted. The performance underlap/ overlap is dominated by other terms to the extent that this condition will not affect system performance.

The F-1 SMA performs well and is acceptable from the view of Systems Engineering for mating with the Flight One Thematic Mapper.

A Providence

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F 1327

W. H. Freudenstein to J. L. Engel HS236-7381 1 April 1981

TABLE I SCAN PROFILE DATA

		*		*
TEST SEQUENCE H	ALONG SCAN PROFILE (µRAD) FWD REV	CROSS SCAN PROFILE (µRAD) FWD REV	BAND-TO-BAND REGISTRATION (%) FWD REY	Overlap/Underlap Max/µBAD
SME 1	+5.4 + 7.4 -6.4 - 3.9	+0.0 +0.3 -1.6 -1.2	0.051 0.039	0.82
SME 2	+8.7 +19.1 -3.1 - 1.7	+0.5 +0.9 -1.2 -0.7	0.044 0 045	1.23
TEST SEQUENCE I	ALONG SCAN REPFATABILITY	CROSS SCAN REPEATABILITY URAD RMS FWD REV 0.56 0.77		
TEST_ SEQUENCE K	Along Scan Repeatability µRAD RMS FWD REV	Cross Scan Reptatap Llity Hrad Rhs Fun Rev	Line Length Repeatability µSEC/o FWO REV	
SME 1	0.62 0.50	0.89 1.13	0.39 0.39	
SME 2	1.26 0.65	•		
TEST SEQUENCE S	Along Scan Repeatability µRAD RMS FMD REV	Cross Scan Repeatability Hrad RMS Fad Rev		
SAE 1	0.85 1.17	0.78 1.13		
SME 2	0.82 0.41	0.65 0.64		
TEST SEQUENCE L	ALONG SCAN REPYATABILITY µRAD RMS FWD REV	CROSS SCAN REPLATABILITY µRAD RMS FLD REV		
SME !	1.57 1.71	0.50 0.61		
SME 2	1.19 0.92	0.55 0.66		•

F 1327

W. H. Freudenstein to J. L. Engel HS236-7381 1 April 1981

TABLE I - SCAN PROFILE DATA - Page 2 of 2

TEST SEQUENCE N	Along Scan Repeatability µRAD RMS FWD REV	CROSS SCAN REPEATABILITY µRAD RMS FWD REV	ORIGINAL P	AGE IS
SME 1	1.13 1.29	1.17 0.82	OF POOR Q	UALITY
SME 2	1.19 1.09	1.06 0.81		
TEST SEQUENCE R	ALONG SCAN REPEATABILITY	CROSS SCAN REPEATABILITY		
SPE 1	1.18 0.51	0.74 0.89		
3ME 2	0.82 0.54	1.70 0.85		
TEST SEQUENCE H-7	ALONG SCAN PROFILE (µRAD) FWD REV	CROSS SCAN PROFILE (µRAD) FWD REV	BAND-TO-BAND REGISTRATION (%) FWD REV	OVERLAP/UNDERLAP /MAX/µRAD
SMR 1	+6.0 +6.6 -5.5 -3.9	-0.1 +0.2 -1.7 -1.3	0.044 0.044	1.23
SME 2	+9.3 +9.9 -3.0 -1.9	-0.1 +0.2 -1.7 -1.3	0.046 0.042	0.82
TEST SEQUENCE	(µSEC) TURN SAM 1 TTA TTB	uaround tidee Sam 2 Tida Tib		
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HUGHES HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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p36 4.3.3.		he Acceptain 4.3.3.2-	nce Test Specif	escription	cument [05 32015-004	B, page 36	as
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p46 4.3.7	Also add	on Page 4	6 paragraph 4.3	.7 the fol	owing:	•		
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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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INTERDEPARTMENTAL CORRESPONDENCE



TO: B. Marchant

cc: HS 236 Distribution

ORG:

SUBJECT: F-1 SMA Re-entry into the Acceptance Test

DATE: February 20 1981

REF. 7731.1/2043

HS 236-2043

FROM: Nick J. Constantinides

ORG. 77-31-11

BLDG. 5

MAIL STA. B146

TOC. CC.

EXT. 7601

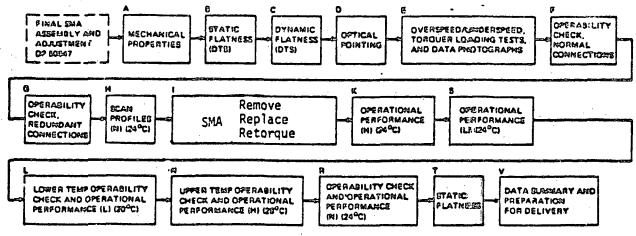
On February 4th the F-1 Scan Mirror Assembly Acceptance Test was interrupted. A penalty Acceptance Test was introduced so that a SAM Offset Angle variation and a pointing angle discrepancy be investigated. This investigation was completed on February 19th.

An IDC on pertinent information and findings resulting from this investigation will be published at a later time.

On February 20th, the F-1 SMA is scheduled to re-enter the Acceptance Test.

The reduced data, and the aforementioned investigation was conclussive of the fact that both SAM Offset and Pointing angle discrepancy were not related to the SMA's thermal and/or vibrational test.

For this reason the recommandation is made that the F-1 SMA re-enters the Acceptance Test starting with Test Flow Event "H" as shown below.



(ii) overall (ii), ii) input voltages, high, rominal, low DTS - gevelopment test station

F-1 SMA Test Flow Event Sequence.

Test flow event I was Vibration and Thermal Cycle. It has been changed to a test that consists of removing and replacing the SMA on the TDS fixture.

It is to be noted that a new scan profile baseline is established by a re-run of Test Flow Event "H" which incorporates new, corrected values for Scan Mirror pointing angles.

Systems Emgineering

Hughes

HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT

F 1330

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F/342



INTERDEPARTMENTAL CORRESPONDENCE

TO: E. A. Anzivino ORG: 77-07

CC:

DATE: 1

8 November 1979

REF.

7934/681

.

SUBJECT: Corrective Action Request 63109 ORIGINAL PAGE IS OF POOR QUALITY

FROM: A. J. Rodenbucher

ORG. 79-34

BLDG.

14005 MAIL STA. W750

LOC. CC

EXT. 7898

After extensive investigation the following was found:

Traceability for the 3558902, S/N 4 housing could not be established. The fact that the 3568902 housing is not physically marked until the 3568911 assembly made obtaining history on the housing impossible.

Assuming that the 3568902 housing for torquer assembly, S/N 4 is in fact the housing manufactured as S/N 4, it is reasonable to surmise from the evidence at hand that the tooling was improperly used.

The personnel currently assigned to the involved activity have been reinformed by their department manager on the importance of strictly adhering to the operation instruction sheet and applicable drawings and specifications. Effective date of corrective action is 30 October 1979.

A judgement error was made by Quality Supervision in assessing bypassed assembly and inspection operations. Subject Supervisor has been instructed to evaluate unusual conditions in assembly/inspection operations more thoroughly. Effective date of corrective action is 8 November 1979.

> A. A. Rodenbucher, Head Engineering Divisions Support Product Assurance Division 79

AJR:maj



INTERDEPARTMENTAL CORRESPONDENCE

TO:

A. Rodenbucher

'

e: E. Shimbel

DATE: 30 October 1979

EF. 7631.20/323

ORG: 79-30

Corrective Action

Request 63109

FROM: R. D. Gourlay

ORG. 76-31

BLDG. 6

MAIL STA.

D163

roc CC

EXT. 21512

All the involved personnel in this department were interviewed regarding the fabrication of the discepant 3568911 torquer assembly. Because of the elapsed time and transfer of some involved personnel, a complete picture of the assembly process for serial #4 could not be pieced together. It is reasonable to summise from the evidence at hand that the tooling was improperly used.

The personnel currently assigned to the involved activity have been reinformed on the importance of strictly adhering to the Operation Instruction Sheet and applicable drawings and specifications.

R. D. Gourlay, Manager

Components Development Department

RDG/gr

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HUGHES

SPACE AND COMMUNICATION GROUP FAILURE REPORT

1352

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INTERDEPARTMENTAL CORRESPONDENCE

F 1352

TO: \E. W. Gossett ORG:

cc: Data Bank (3)

DATE: 3 December 1979

REF. 771510/007

HS236-1654

FROM: R.L. Coon

ORG. 77-15-15-

BLOG. 12 LOC. CC

MAIL STA. V104 EXT. 7433

SUBJECT: Scattering Tests for TM Mirrors

REP. TFR # F-1352

Due to the high scattering exhibited by Mirror S/N 5, all mirrors must be measured at HAC for scattering and accepted prior to coating at Denton Vacuum.

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HUGHES

SPACE AND COMMUNICATION GROUP
FAILURE REPORT

F 1353

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Hughes

UGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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-	DARTHORNMETER VOICE PAGE 170-45 17/31/79 DESTRUCTOR											
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HUGHES

SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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			AND PART NUMBER	·	~~~~						
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SECTION 2.3 POWER SUPPLY

Section 2.3.1

Power Supply

Performance Data

The acceptance performance (test) data for the Power Supply is contained in Appendix C (Vol. IV, Part C).

2.3.2 Acceptance Data

2.3.2.1

AS-BUILT CONFIGURATION LIST

POWER SUPPLY ASSEMBLY 50869 S/N 004

IND LVL	PART NO.	NOMENCLATURE		CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
01	50869	ASSY, POWER SUPPLY		D 2015A 2039A D030	D 2015A 2039A D030	D 2015A 2039A D033	004
				D068 W074	D068 W074	D068 W074	
				W092 W093 W101	W092 W093 W101	W092 W093 W101	
02	53319	CHASSIS-POWER SUPPLY		B 9090	B 9000	B 9090	N/A
03	53669	COVER, BOTTOM	0.0	A 9471	A 9471	A 9471	N/A
03	53670	COVER, TOP	ORIGINAL OF POOR	A 9474 9893 2025A	A 9474 9893 2025A	A 9474 9893 2025A	N/A
02	53664	BUS BAR	PAGE IS QUALITY	A 9071	A 9071	A 9071	2
02	53308	PRINTED WIRING ASSY	ITY SI	A 9060 9069 9465 9485 #D123 D124	A 9060 9069 9465 9485 D124	A 9060 9069 9465 9485	3,4
02	51566	PRINTED WIRING ASSY		A 8527	A 8527	#B124 / A 8527	3,4
				9055 9080 9097 2020A	9055 9080 9097 2020A	9055 9080 9097 2020A	
: ' :				#D123 D124	D124	#D123 ~ D124	
			#D123	was cancell	ed and repl	aced by	1

* 11 K			ALIABANG BAAPAG BA KIIVI V APEC
LVI.	PART NO.	NOMENCLATURE	CURRENT ACCEPT. AS-BUILT SERIAL REVISION REVISION REVISION NUMBER
02	51578	PRINTED WIRING ASSY	B B B 2 2002A 2002A 2002A #D123 D124 #D123 D124 D124
02	53555	PRINTED WIRING ASSY	C C C 2 9881 9881 9881 D069 D069 #D123 D124 #D123 D124 D124
02	51570	PRINTED WIRING ASSY	C C C 3,4 D069 D069 #D123 D124 #D123 D124 2049A D124
0 2	52113	PRINTED WIRING ASSY	2049A 2049A B B 1403A 1403A #D123 D124 #D124 D124
02	51574	PRINTED WIRING ASSY	C C C 4,5,6 #D123 D124 #D123 D124 D124
02	52976	PRINTED WIRING ASSY	A A A 2 6998 6998 9079 9079 9079 9467 9467 9467 9467 8 #D123 D124 #D123 D124 D124
03	51562	PRINTED WIRING ASSY	D069 D069 D069 D123 D124 D124 D124
02	51594	PRINTED WIRING ASSY → 3	B B B 2 D069 D069 D069 #D123 D124 #D123 D124 D124
02	51627	FILTER ASSY	A A A 2 8891 8891 8891 9479 9479 1408A 1408A 1408A 1999A 1999A

P/N 50869

+W103 was cancelled and replaced by W104

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VL VL	PART NO.	NOMENCLATURE		CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
2	51656	FILTER ASSY		Α Α	A	A	1
				9473 9480	9473 9480	9473 9480	,
				1409A	1409A	1409A	
				1998A	1998A	1998A	
2	51611	INPUT CHOKE		A	A 9049	A 9049	3,4
			•	9049 1437A	1407A	1407A	
2	51590	PRINTED WIRING ASSY		Ε	E	Ε	2
				D059	D069	D069	
				#D123 D124	D124 W078	#D123 D124	٠.
				H078	W104	W078	•
	•			+W103 W104		+W103 W104	
2	51519	PRINTED WIRING ASSY		F	F	F	2
_				2042A	2042A	2042A	
_	•			2043A 2047A	2043A 2047A	2043A 2047A	0.0
j.			<i></i>	2048A	2048A	2048A	ORIGINAL OF POOR
<i>t</i>	•			D069 #D123	D069 D124	D069 #D123	O N
\sim	•		• •	D124	W078	D124	ž F.
	•		•	W078	W104	N078	QU.
		· .		+H103 H104	2052A	+W103 W104	PAGE IS
2	52951	TRANSISTOR		2052A	Δ	2052A	₹ ਯ _{N/A}
•	32331	TRANS STOR		1414A	14Î4A	1414A	,
2	53672	XSTR MTG BRACKET		A	A	A	N/A
3	53297	TERMINAL STRIP		Α	Α	A	N/A
2	51651	RETAINER, PCB		A	Α	A	N/A
2	52901	INSULATOR, SCREW		A.	A	A	N/A
2	53298	TERMINAL, STANDOFF '	•	A	A	· A	N/A
2	53678	CARD GUIDE, PWB		Α.	A	A	· . N/A
				9489	9489	9489	
2	53679	BACKUP SPRING		B was cancel	В	В	N/A

P/N 50869

LAF THD	PART NO.	NOMENCLATURE		CURRENT REVISION	ACCEPY. REVISION	AS-BUILT REVISION	SERTAL NUMBER
02	53666	WIRE LIST, THEMATIC		D D102 W079	D D102 W079	D D102 W079	N/A
02	53299	SHIELD ASSY		В D068	B D068 /	B D068	2
02	51615	PWB ASSY		A 8371 9082 #D123 D124	A 8371 9082 D124	A 8371 9082 #D123 D124	2
02	53561	REGULATOR ASSY		A 8362 9068 9483 2006A	A 8362 9068 9483 2006A	A 8362 9068 9483 2006A	2
02	53668	CAPACITOR PLATE ASSY	ORIGINAL OF POOR	A 9066 2010A	A 9066 2010A	A 9066 2010A	3,4
02	53674	CHOKE ASSY	POO	A	A	A	3,4
02	53675	INDUCTOR ASSY	2 -	A	A	A	3,4
02	53311	XFMR MODULE ASSY	PAGE	B 1410A	B 1410A	B 1410A	4,5
02	52531	TRANSFORMER ASSY	S Y	B 9470	B 9470	8 9470	3,4
02	53316	XFMR MODULE ASSY-MUX		B 1412A	B 1412A	B 1412A	4,5
02	53563	TRANSFORMER ASSY		A 8370 9478	A 8370 9478	A 8370 9478	3,4

#D123 was cancelled and replaced by D124

	9			49	Ğ	₩ 📆	P/N 5086	9	.
•	LAF	PART HO.	MO	MENCLATURE		CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
	02	53558	POWER SUP	PLY		A	: A	A	N/A
	03	51655	SCHEMATIC	DIAGRAM		D 1415A 2007A 2041A	D 1415A 2007A 2041A	D 1415A 2007A 2041A	N/A
		3169178	LUG, TERM	INAL		59211	59211	59211	N/A

QUALITY ASSURANCE

DATE

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2-9-82

CONFIGURATION/DATA MANAGEMENT

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POWER SUPPLY

Listing of Liens

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POWER SUPPLY

P/N 50869

FLIGHT

Failure Re	port Number
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F3868	F1035
S8102	F1036
	F1439
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	F3865
	F3866
	F3867
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1	F4835
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POWER SUPPLY

P/N 50869

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATIONS GROUP

NUENES AIRCRAFT COMPANY CE AND COMMUNICATIONS GROUP LEL (SEUNDO, CALIFORNIA FAILURE REPORT

3865

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SPACE AND COMMUNICATIONS GROUP

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FAILURE REPORT

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	6. HAROWARE LEVEL C SP WHEN FAILURE WAS OBSERVED C SY	ACECRAFT	C SUBSYSTEM			C MODULE	CARO D PART	
	EQUIPMENT IDENTIFICATION:		NAMES		PART NUMES	R S/N		PACTURER
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MARUFACTURING	28. UST ALL PARTS REPLACED	CKT SYM P	PART LOT NUMBER	DATE CODE	WANUFACTURER	PROBABLE	DEFECT	AMALYSIS MUMSER
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ATTROHMENT TO FREF3866

TS 16603
Rev B

10 December 1980
SCN-2 7-6-91
SCN-2 11/3/£1

10.5 Performance test (short form) data sheets (continued)

REF, PARA,	DESCRIPTION	DVH SWITCH POSITIONS	LIMITS	MEASUREMENT PRIMARY REDUNDANT
5.11.4.1.13	Band 6+ load current	S26-7, S34-11	mV ÷ 0.5 ∽ mA	
5.11.4.1.14	Band 6 - load current	S26-7, S34-12	$mv \div 0.5 = mA$	
5.11.4.1.15	SMA Htr + load current	: \$26-8, \$34-1	$mV \div 0.5 = mA$	
5.11.4.1.16	SMA Htr - load current	: S26-8, S34-2	mV = mA	
5.11.4.1.17	SMA +29V load current	S26-8, S34-3	$mV \stackrel{4}{\sim} 0.402 = mA$	•
5.11.4.1.18	SMA -29V load current	S26-8, S34-4	$mV \div 0.402 = mA$	
5.11.4.1.19	SMA +7V load current	\$26-8, \$34-5	V ÷ 0.1 = Amps	
5.11.4.1.20	Analog - load current	\$26-8, \$34-6	mV ÷ 0.402 = mA	
5.11.4.1.21	Radiometer load curnt	\$26-8, \$34 <i>-</i> 9	mV + 0.5 - mA	
5.11.4.1.22	CDVU load current	S26-8, S34-10	mv ÷ 0.5 = m4	
5.11.4.1.23	Eletrmeh load current	\$26-8, \$34-11	mV ÷ 0.402 = ma	
5.11.4.2.1	Bus power apply vitge	\$26-1, \$27-1 (\$27-3 for RLT)		
5.11.4.2.2	Bus input current	\$26-1, \$27-2 (\$27-4 for RDT)	mV ÷ 10 = Amps	Actividation experimental exper
5.11.4.2.3	PIN (Section 5.11.4)		/ . . .	
5.11.4.2,4	PIN (Section 5.11.2)	heed ?	with a	
5.11.4.2.5	PIN (avg)	heed.	,	CONTRACTOR CONTRACTOR .
5.11.4.3.1	POUT	semon for	Land	CONTRACTOR CONTRACTOR
5.11.4.3.2	Efficiency	J. () }~	> 70%	
5.11.5.1	Bus voltage	\$26-1, \$27-1 (\$27-3 for RDT)		williagescalagescalagescalagescalagescalagescalagescalagescalagescalagescalagescalagescalagescalagescalagescal
5.11.5.2	Imput bus current	\$26-1, \$27-2 (\$27-4 for kDT)	mV ÷ 10 ≈ Amps	
5.11.5.3	SMA Etr + otpt vitge	S26-2, S27-5	21.20 ±2.127	
5.11.5.4	SMA Htr + otpt rpple	Seen on Scope	<530 mV pk-p	K
5.11.5.5	SMA Htr - otpt vltge	\$26-2, \$27-6	-21.20 ±2.12V	
5.11.5.6	SMA Htr - otpt rpple	Seen on Scope	<630 mV pk-p	k
5.11.5.7	CDVU output voltage	S26-3, S27-3	5.00 ±0.80	V
5.11.5.3	CDVU output ripple	Seen on Scope		k
5.11.5.9	Outgas - otpt vltge	S26-3, S27-7	80.00 ±8.00	V
5.11.5.10	Outgas - otpt rpple	Seco on Scope	<2.5V pk-pk	
5.11.5.11	Parasitic otpt vltge	S26-3, S27-9 (S27-10 Rdt)	30.0u ±0.90	<i></i>

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ATTACHMENT TO FR# F3866

TS 16603 Rev B

SCN-2 7-6-81 SCN-3 11/3/81

10.4 Performance test (continued)

REF, PARA.	DESCRIPTION	DVM SWITCH POSITIONS	LIMITS	MEASUREMENT PRIMARY REDUNDANT
5.10.5.1.17	SMA +29V load current	S26-8, S34-3 mV	7 ÷ 0.402 = mA	
5.10.5.1.18	SMA -29V	S34-4 PAV	/ ÷ 0.402 □ mA	
5.10.5.1.19	SMA +7V	534-5 V	+ 0.1 = Amps	
5.10.5.1.20	Analog -	534-6 mV	÷ 0.402 = mA	
5.10.5.1.21	Radiometer	\$34-9 mV	' ÷ 0.5 - mA	
5.10.5.1.22	CDVU	S34-10 mV	. 0.5 = mA	
5.10.5.1.23	Electromech. load current	S26-8, S34-11 mV	÷ 0.402 = mA	
5.10.5.2.1	Bus power supply voltage	S26-1, S27-1 (S27-3 for RDT)		
5.10.5.2.2	Bus input current	S26-1, S27-2 EV (S27-4 for RDT)	÷ 10 a Amps	
5.10.5.2.3	PIN (Section 5.10.5)			(
5.10.5.2.4	PIN (Section 5.10.3)			2
5.10.5.2.5	PIN (evg)	. •		
3.10.5.2.9	Input current at current	linit	26-1, 27-2 (26-1 27-4 Rdt)	
	Input voltage at current	limit	27-1 (27-3 Rdt)	
	MUX voltage at current lin	nit	26-3, 27-1	
	MUX current at current lis	nit	27-12	William (William)
5.10.5.3.1	Four			Stu 2
5.10.5.3.2	Efficiency		> 70%	

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SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

F 3867

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	B. HARDWARE LEVEL TO COLCEGNATE		SSEMBLY D MODUL		
-	WAS OGSERVED SYSTEM		JBASSEMBLY I MICAM		
İ	EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER		UFACTURER
	7 SUBSYSTEM			,	
ŀ	9. UNIT COLUMN CARLES FE			 	
1	POWER SIED F	T-SN-004)	50869	004 HAC	
- e	ASSEMBLY SUBASSEMBLY				
2	10. C MOGULE C MICAM C CARD			† · · · · · · · † · · · · · · · · · · ·	
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5	17. F.	A FIRE ST	915 - (6)		
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Œ	12. DOCUMENT IMPLEMENTING CORRECTIVE ACTION			1//0	
100	34. 9ASIC CAUSE DESIGN OF VERIFIED ENVIRONMENTAL		G. PROCEDURE WIRING	ERROR AUDUNANOWN	DEFECT CODE
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2	16. FAILURE PRIMARY	☐ UNKROWN ☐ NO FAILURE	SE FAILURE CLASSIFICATION THE VAL		, ,
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Candran.

ATTACHMENTS TO FIZ F 53867 AVOID VERBAL ORDERS



10 _	F. R. PHILLIPS	FRCM .	FRANK CAR	LE	
rurect .	PRELIMINARY THEMATIC MAPPER PMPCB	espt .	44-29-00	BATE _	12/1/
	RECOMMENDATION - 908307-2 RELAY	61.63 .	\$13	E .	D329
		Les.	SC	est .	5-935

CONFIRMING OUR RECENT TELEPHONE CONVERSATION, A TELEPHONE POLL OF THE THEMATIC MAPPER PMPCB HAS BEEN MADE TO ARRIVE AT AN EARLY RECOMMENDATION ON THE DISPOSITION. OF THEMATIC MAPPER 908307-2 RELAYS. OUTLINED BELOW ARE PRELIMINARY RECOMMENDATIONS.

- 1. CHANGE OUT F-1 RELAYS FOR THOSE OF LOT DATE CODE 7846, WHICH SUCCESSFULLY PASSED SCREENING TESTS AT TELEDYNE, AND ARE BEING REIDENTIFIED TO CDU00702.
- 2. RETAIN THE CURRENT PROTOFLIGHT SYSTEM RELAYS (ALL OF LOT DATE CODE 7846) IN THE SYSTEM WITHOUT CHANGEOUT.

THE REASON FOR THIS RECOMMENDATION IS AS FOLLOWS:

- A. INTEGRITY OF RELAYS OF LOT DATE CODE 7846 WAS ESTABLISHED

 BY A SCREEN OF 39 PIECES. WITHOUT A PICK-UP VOLTAGE MANG-UP.
- B. LACK OF INVENTORY ON RELAYS LOT DATE CODE 7615 (ONE OF WHICH WAS THE FAILURE), AND LOT DATE CODE 7330, WHICH ARE IN F-1 PRE- ' CLUDES EARLY VALIDATION OF INTEGRITY PROVING CONCLUSIVELY THAT THE FAILURE IS RANDOM.
- C. RATHER THAN SUFFER FURTHER SCHEDULE DELAYS TO F-1, CHANGEOUT TO THE SCREENED 7846 PARTS APPEARS THE EXPEDIENT SOLUTION.

E. F. CARLE

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SANTA BARBARA RESEARCH CENTER

INTERNAL MEMORANDUM

TO [L. 0'Commoll

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CC: See Distribution List DATE: 6 November 1981

RUF: HS236-7711

REAR 81/57

FROM A. Huber

BLDG. B11 MAIL STA. 102

EXT. 6246

SUBJECT: Power Supply 908307-2 Relays (FB: F3867)

FR: | F3867, dated November 2, 1981

Following acceptance test vibration of the flight Model power supply. test of the power supply revealed that the power supply could not be commanded to the OFF state. It was verified by measuring coil current to the relay that the command to the OFP relay (A24-R5) was proper (+28V pulse for 6ms). The power supply cover was then removed and the miniswitcher board instrumented to investigate the failure. Subsequent testing found that the relay then functioned; the audible sound of relay contact transfer could be heard. (This sound was not present during earlier testing.) The relay (9080307-2, Teledyne part no. 412-6111, date code 7615, serial no. 183) was removed and seat to Teledyne for failure analysis.

There are a total of eight 908307-2 relays in the power supply: four each in the primary and redundant supplies. Each of the four relays within a given power supply performs one of the following functions:

> curns the supply ON (relay 1) (a)

> (5) turns the supply OFF (relay 1)

applies JOV to the sultiplexer and removes JCV from (c) the parasitic our load (relay 3)

applies JOV to the parasitic aux load off removes (d) JOV from the multiplexer.

Figure 1 illustrates the circuitry associated with the two relays that turn a given power supply (primary or redundant) to the ON or OFF states. The 908307-2 relays are non-latching relays which momentarily (6 ms) apply signal ground to the input of 30 ms single shots. The single shots, in turn, apply voltage to the first of two high-current (power) relays to apply or remove bus voltage to power supply circuitry.

There are two power relays in series. The second power relay has associated with it a 10 ohm power resistor. This resistor limits the inrush current. When the voltage at the 10 ohm resistor reaches +18.5, the contacts of the second power relay close, thereby shorting the resistor. The power supply is then fully operational. The second power relay opens and closes as a function of line voltage (+18.5V) threshold), controlled by voltage sensing circularry within the power supply.

Once a power supply has been commanded to the OM state, the contacts of the first power relay can only be opened by three events:

To: L. O'Connell From: A. Huber

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(1) the issuance of an OFF command (by the 908307-2 Off command relay)

(2) a line voltage in excess of +38.5V, thereby causing overvoltage shutdown

(3) an overvoltage associated with the internally generated +30V reference voltage (+34V initiates the shutdown)

It is possible to command a power supply to the ON state (requires the presence of line voltage) and then remove the bus voltage. This leaves the contacts of the first power relay in the closed state. The contacts of the second relay open when the bus voltage drops below +13.5V (thereby reinserting the 10 ohm power resistor). Reapplication of bus voltage will cause the contacts of the second power relay to close (similar to a commanded ON sequence). Initial inrush current will be limited by the 10 ohm resistor.

The above demonstrates a sequence that can be initiated prior to launch, to guarantee that at least one power supply will receive power after launch. It removes the possibility that neither power supply can be turned on due to the failure of both ON relays.

Figure 2 illustrates the circuitry associated with the two relays that control the application and removal of 30V to the multiplexer and the parasitic mux load. Each command relay (908307-2) momentarily (6MS) applies signal ground to the input of a 30MS single shot. The single shot, in turn, applies voltage to the coil of a latching power relay.

Figure 3 illustrates the interconnection of the contacts of the multiplexer relays of the primary and redundant power supplies. For the configuration shown, the redundant power supply is connected to the multiplexer and the primary power supply is connected to the parasitic load.

A failure mode can be defined in which one power supply (primary) cannot be commanded off, and its multiplexer relay cannot be commanded to the multiplexer position (two relay failures exist). This requires that the redundant power supply be commanded ON, and that its multiplexer relay be commanded ON. The configuration is then as shown in Figure 3:

Electrically it is possible to command both power supplies ON at the same time, however, the thermal characteristics of the power supply unit with both power supplies ON has not been investigated. The power supplies will then share all loads except the multiplexer load, unless both multiplexer relays are switched to the multiplexer load. If this is done the power supplies will share the multiplexer load as well.

With both power supplies ON, the effective overcurrent shutdown threhold is increased by the degree to which the power supplies share the loads. The effective power supply efficiency is decreased

To: L. O'Connell From: A. Huber ORIGINAL PAGE IS OF POOR QUALITY

HS 236-7711 Page3

F3767

since the load power remains the same, but there are additional losses associated with the second supply. The temperatures within the power supply unit would be expected to increase because of the additional loads of the second supply.

The above concludes the report describing the power supply failure involving the 908307-2 relay. The power supply is the only assembly that uses 908307-2 relays.

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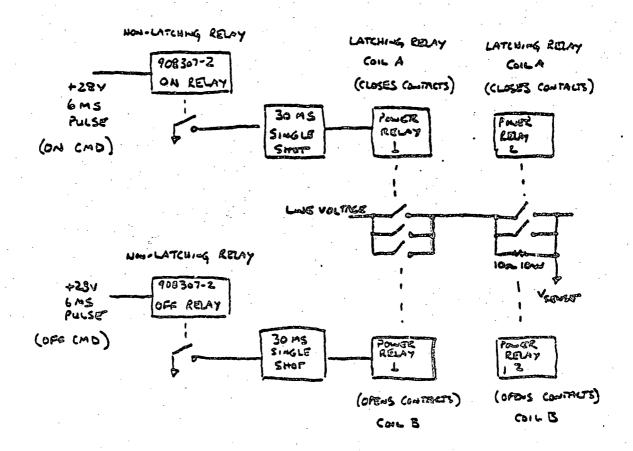


FIGURE 1. PRIMARY (OR REDUNDANT) POWER SUPPLY
ON/OFF RELAY COMMAND STRUCTURE (CONCEPTUAL)

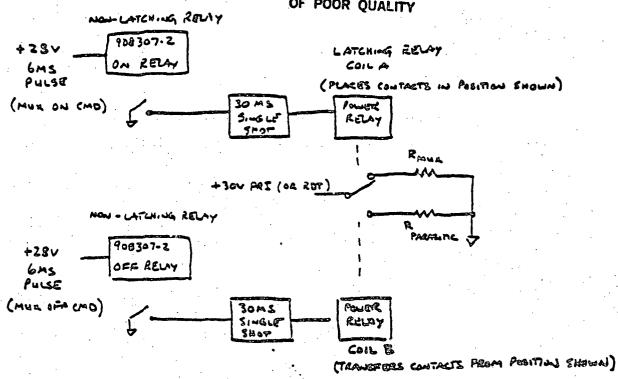


FIGURE Z. MULTIPLEXER COMMAND RELAY STRUCTURE (ONE POWER SUPPLY)

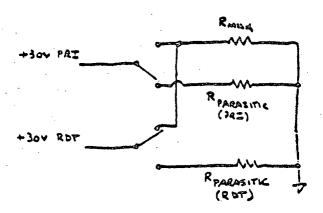


FIGURE 3 . PRIMARY/REDUNDANT MULTIPLEXER RELAY CONTACT
CONFIGURATION

SANTA BANBARA RESEARCH CEITTEN

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10. L. OCONNELL	DATE 11-9-81			
IRON A. HUBER	SUBJECT POWER SUMPLY			
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ROF: 145 236 - 7711 (dan	-1) //-6-81)			
	a. Ahrber			
CC. L. ALTMAN				

SERC FORM 14-0312



INTERDEPARTMENTAL CORRESPONDENCE



TO: E.F. Carle

CC:

DATE: 10 December 1981

REF. 7611.42/502

SUBJECT: SEM Analysis of Teledyne

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FROM: P.R. Catizone

ORG. 76-11-42

Relay, HAC P/N 908307-2.

S/N 7364

ONG. 70-11-45

roc. CC

MAIL STA. C135 EXT. 7619

INTRODUCTION

This relay failed after vibration in the Thematic Mapper flight unit. It saw 28 ±2 V in a 6mS pulse but did not transfer. It passed gross and fine leak tests. It went through vibration tests as per CDU 00691 and passed all but two where it required 18.7 and 18.2 volts to actuate as compared to the minimum of 14.7. The relay was delidded and inspected visually at Teledyne where it was determined that one of the guide pins was adjusted too high and not allowing enough play in the socket of the armature. A SEH analysis was done to look for any wear and/or material transfer at points of moving contact.

RESULTS

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Upon visual inspection of the delidded relay, one could see two salient points. First of all the armature did not touch the core shank in all places (see Figure 1). In fact, the two were only in contact over a small area. Also, the right guide pin (as viewed in Figure 1) was set higher than the left. Although it may be difficult to see this in the picture, it was clearly visible with the part at hand under a microscope. This was in agreement with the visual inspection done at Teledyne. This point, together with an apparent bowing of the armature and uneveness of the core shank, is the cause of the mismatch between the two.

A view of the armature sockets under SEM revealed excessive wear along the top of the right socket (see Figure 2). Note that the socket in Figure 2 is upside down compared to the assembled relay in Figure 1. The left socket did not show nearly as much wear on the top although looked virtually the same on the sides as the right socket. This is in good agreement with the high adjustment of the guide pin and lack of play in the right side observed before dismantlement. The guide pins themselves showed no irregular surface disturbances or material transfer, so apparently the smearing of plating in the sockets is just a result of the pins rubbing and bumping, not cold welding or similar type problem.

A look at the pivot edge side of the armature showed a "groove worn in (Figure 3) with most of the wear near the area that appeared in contact with the core shank (see Figure 1). A close-up of this area is shown in Figure 4. Although no nickel from the plating of the core shank was found transferred to the armature, material from the armature was found along the pivot edge of the core shank. The armature itself consists of an iron core with successive layers of copper, palladium and a thin layer of gold plating. An examination of the core shank in the area that corresponds with the groove area shown in Figure 4 revealed much transfer of gold, palladium and copper from the armature (see Figures 5 and 6). This

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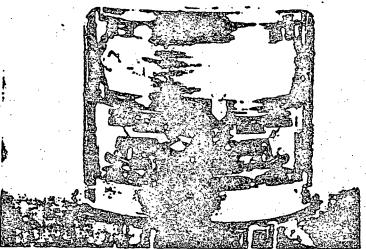


FIGURE NO. 1

Picture of delidded relay showing uneven matching between armature and core shank. The two are only in contact where the arrow indicates. Note also that the right guide pin is higher than the left.

MAGNIFICATION 10X

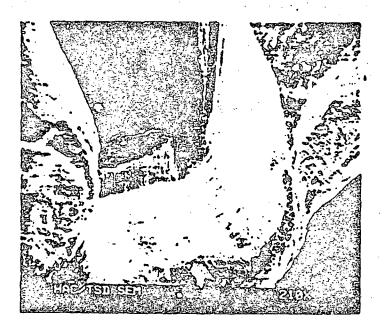


FIGURE NO. 2
Right socket showing smearing due to high guide pin.
MAGNIFICATION 210X

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FIGURE NO. 3
View of armature actuator showing groove worn in due to pivot action against core shank.

MAGNIFICATION 22X

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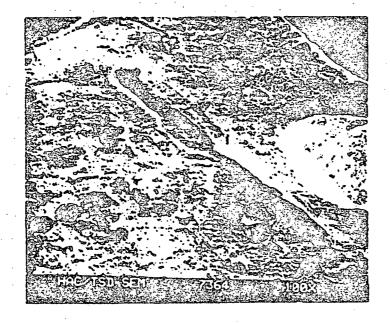


FIGURE NO. 4
Close up of area marked by arrow above. This is the area that appears in contact with the core shank in Figure 1.
MAGNIFICATION 100X







FIGURE NO. 5
Close up of pivot edge of core shank in area that appeared in contact with the armature (see Figure 1). The bright splotches are gold plating from the armature.

MAGNIFICATION 1100X

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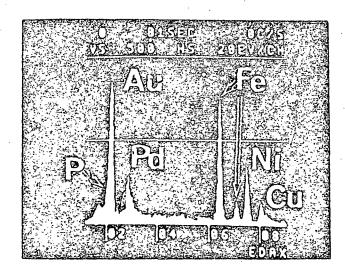


FIGURE NO. 6

EDX of pivot edge above. Note that gold, palladium and even copper have been transferred to the core shank which is iron with electroless nickel plating.



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FIGURE NO. 7 View of end of spring MAGNIFICATION 106X

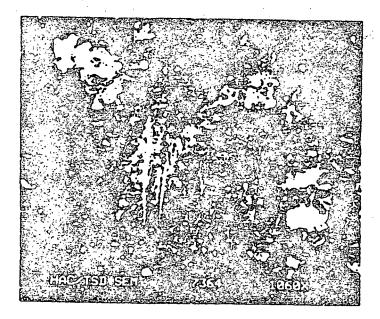
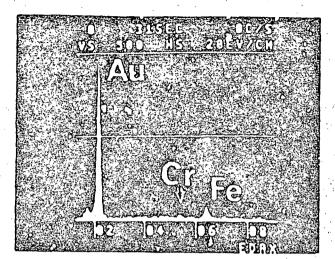


FIGURE NO. 8
Close up of spring from area marked by arrow above.
Light flakes are gold.
MAGNIFICATION 1060X



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FIGURE NO. 9

EDX of a light area in Figure 6 showing presence of gold. The base metal of the spring is an Fe-Cr-Ni alloy.

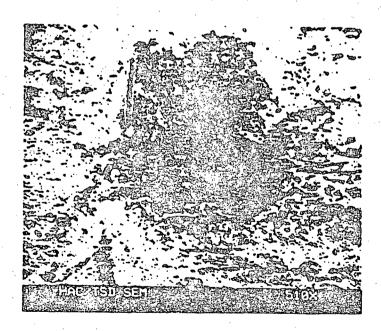
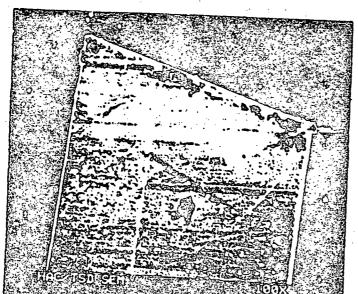


FIGURE NO. 10
Close up of spring contact area on armature.
MAGNIFICATION 510X



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FIGURE NO. 11

View of the right movable contact showing the area that hits the lower stationary contact. The other three surfaces are very similar.

MAGNIFICATION 100X

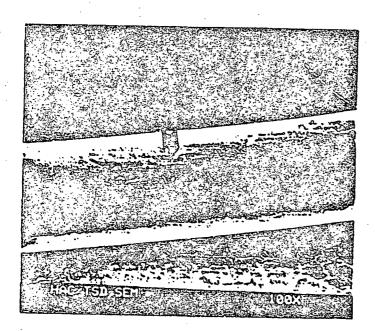


FIGURE NO. 12

View of the lower stationary contact that matches with the movable contact above. The arrows point to two lines of surface disturbances.

MAGNIFICATION 100X

SANTA BARBARA RESEARCH CENTER A Subdission of Musica Autority Company

INTERNAL MEMORANDUM

TOFL: O'Connell

SUBJECT: Power Supply

CC: See Distribution List DATE: 6 November 1981

REF: HS236-7711 REAH 81/57

FROM: A. Huber

A. EUDer

BLDG. B11 MAIL STA. 102 EXT. 6246

908307-2 Relays (FR:F3867)

FR: \ F3867, dated November 2, 1981

Following acceptance test vibration of the Flight Model power supply, test of the power supply revealed that the power supply could not be commanded to the OFF state. It was verified by measuring coil current to the relay that the command to the OFF relay (A24-K3) was proper (+28V pulse for 6ms). The power supply cover was them removed and the miniswitcher board instrumented to investigate the failure. Subsequent testing found that the relay then functioned; the audible sound of relay contact transfer could be heard. (This sound was not present during earlier testing.) The relay (9080307-2, Teledyme part no. 412-6111, date code 7613, serial no. 183) was removed and sent to Teledyme for failure analysis.

There are a total of eight 908307-2 relays in the power supply: four each in the primary and redundant supplies. Each of the four relays within a given power supply performs one of the following functions:

- (a) turns the supply ON (relay 1)
- (b) turns the supply OFF (relay 2)
- (c) applies 30V to the multiplexer and removes 30V from the parasitic mux load (relay 3)
- (d) applies 30V to the parasitic mux load and removes 30V from the multiplexer.

Figure 1 illustrates the circuitry associated with the two relays that turn a given power supply (primary or redundant) to the ON or OFF states. ()
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There are two power relays in series. The second power relay has associated with it a 10 ohm power resistor. This resistor limits the inrush current. When the voltage at the 10 ohm resistor reaches +18.5, the contacts of the second power relay close, thereby shorting the resistor. The power supply is then fully operational. The second power relay opens and closes as a function of line voltage (+18.5V) threshold), controlled by voltage sensing circuitry within the power supply.

Once a power supply has been commanded to the ON state, the contacts of the first power relay can only be opened by three events:

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To: L. O'Connell From: A. Huber

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since the load power remains the same, but there are additional losses associated with the second supply. The temperatures within the power supply unit would be expected to increase because of the additional loads of the second supply.

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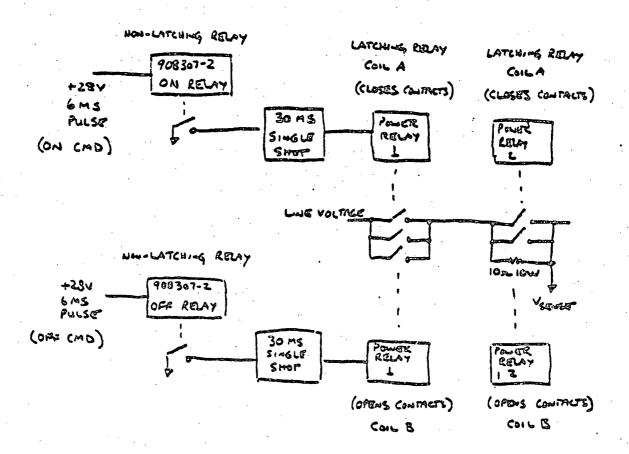


FIGURE 1. PRIMARY (OK REDWODANT) POWER SUPPLY ON/OFF RELAY COMMAND STRUCTURE (CONCEPTUAL)

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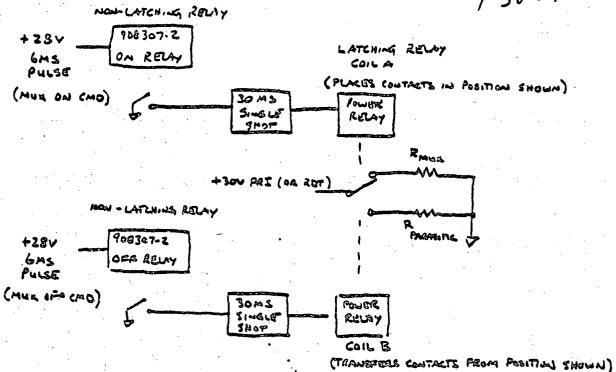


FIGURE Z. MULTIPLEMER COMMAND RELAY STRUCTURE (ONE POWER SUPPLY)

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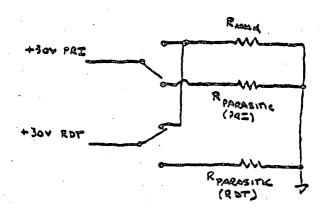


FIGURE 3 . PRIMARY/REDUNDANT MULTIPLEXER RELAY CONTACT
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WOLTHAUSEN, L. H.

SANTA BARBARA RESEARCH CENTER

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FAILURE REPORT

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SPACE AND COMMUNICATIONS GROUP

MUGNED AIRCRAFT COMPANY
SEACE AND COMMUNICATIONS GROUP
LE SEGUNDO, CALIFORNIA

FAILURE REPORT

	EL SEGUNDO, CALIFORNIA				•
Γ	THERETIC INHOPESE	6330	FIGHT TIME	OBSERVED S.	DATE COREAVED O 5 DA 4 YR 6
	O MAROWARE LEVEL SPACECRAFT WHEN PAILURE SYSTEM		SSEMBLY MODU	LE .	CARD PART
1	EQUIPMENT IDENTIFICATION:	NAME	PART NUMBER	S/M	MANUFACTURER
	7. SUBSYSTEM	1			
	* UNIT POWER SUPPLY (PLT-5N-4	50869	4	HAC
Œ	D ASSEMBLY AND Y	1-PWB	51590	2	HAC
ATO	IQ MODULE I MICAM I CARD				
픙	11. OTHER				
ORIGINATOR	12 TEST WHEN DEVELOPMENT OF SERVED AIN-PROCESS		TEGRATION LAUNCE	GPERATIONS	
		RADIATION TE			R8 ATTA BR
	14 DESCRIPTION MAIGI - SWITCH	ER CHECK	WT-REAUNDE	NTOGS	CRUED NO BASE
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	UP PULSE WIDTH ON	MAXI-PWB.	NO LOAD COM	DITION	
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8	FAILURE ANALYSIS ENGINEERING	TESTS INDI	CATE TRANSIS	TOP 017	ON A23
A	(22240 EM-2) EMITED -	CREAL GROUTTE	ER a SUBBARY	DRAPONS	UT BREAMIS
EVALUATION	ANALYSIS COMPLENT	STRESS A	10 FAILED ITEM NAME OF A		MOTOROLA
	ZD AGLIOWING REMORK/RETEST REQUIRED	· · · · · · · · · · · · · · · · · · ·	AND PART NUMBER	SISTOR	<u>90 8 8 8 1 - 1 - 1 - 1 - 1</u> SS 2 9 3 8 H - 1
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SPACE AND COMMUNICATIONS GROUP

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUN
PL EXCUIDO, CALIFORNIA

FAILURE REPORT

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E	5/	ORT.	, 40 /			-4.		` <i>J</i> /^
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/AE	120	V MANANCEIP	CRUPAGO	3 10 F	ADALA / VOI	31. CONTINUATION SHEET USED		
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NEE	34. BASIC CAUSE OF VERIFIED	OESIGN	TEST EQUIPMEN	T D M	FG. PROCEDURE	WIRING ERROR ROUGH HANDUNG WEAR-OUT	D UNKNOWN	DEFECT CODE
ENGINEERING/RELIABILITY	FAILURE 38. FAILURE	DEFECTIVE PARTS	UNKNOWN		38. FAILURE	CRITICAL	MINOR SAFETY	
1	TYPE II. PASHON SIPPE ENGIL	PRIMARY A INDUCED	ORG DA	41-	CLASSACATION	ROLAM DE MENER	1000	DATE
	30. RELIABILITY	18au	0RG // 0A	4101	40. CLPTCPIN ON SU	IPPLE		910727 DATE
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SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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	6. HARDWARE LEVEL WHEN FAILURE WAS DESERVED		CECRAFT	SUBS		□ 4	SSEMOLY	☐ MODUL		CARD PART				
	EQUIPMENT IDENTIFICA	<u> </u>			AM		PART NUM		S/N		UFACTURES			
	7. SUBSYSTEM			Δ										
	& UNIT PAWE	r S	IPPLY	[PLT	SN.	4	5086	9	4	HAC				
Œ	A C ASSEMBLY	SUS	ASSEMBLY	1 N/ -	PINB		5161	9	. 2	HA				
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ORIGINATOR	11. OTHER							·	1					
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	13. ENVIRONMENT. WHEN FAILURE WAS ODSERVED	AM	Kent Vra	RACIA VIBRA		☐ TE		THERMA	L VAC	TA &RH				
	OF FABLISH TON TO THEN MAXI UP BUT IT ONLY TURNS ON A LITTLE FOR													
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	15. TEST PROCEDURE	600			PARA	19. Of	FOLAR	,	CAG	DATE -9-8/	17. CONTIR	MOTTALIS CEIEU		
80	18. VERIFICATION AND		LONG B	ISE TO	EniT	1522 V	ALUE FOR	A24	سليلت مليك	WAS 186	E 5%	" Kus		
8	SAMULT BE 5	IK &	5% . 18	72/	- N	- 0		WEEE	AVER	. sieces		500		
12	ATTACHOO	GJ'	7.											
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108					21. AUT 16:3	O-ZATICH			CRO	CANE _	7/ CONTE	ALA TICM		
	ZI. REWORK/RETEST				71. AU	EBAL	<i></i>		41-33	5-9-81	24 CONTIN	USED USED		
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	23. UST ALL PARTS RE						T	- Т			-			
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44	35. FAILURE TYPE	PRIM		UNENC		, ,	35. FAILURE CLASSIFICATION	CRITI	12 -	MINOR D SAFETY				
	J7 RESPONSIBLE THE	SUC.	(ON)	41-33		1/8/	I SPACEOUTT		EFF	2261	BID	727		
	39. RECKBUTY	- 0	(57-4	DATE 7	23-8/	WE WELL ON	SUPPLIER		المحتاث سيد	DATE			
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SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

1_	GE SEGUNDO, CALIFORNIA	
İ	THE MATIC MAPPER E330 FLIGHT 11:00 Am AU 5 DA	13 YR 81
	AARDWARE LEVEL SPACECRAFT SUSSYSTEM ASSEMBLY MODULE CARD WHEN FAILURE SYSTEM SUBASSEMBLY MICAGE PART WAS DOSERVED SYSTEM SYSTEM SUBASSEMBLY MICAGE PART	
	EQUIPMENT IDENTIFICATION: NAME PART NUMBER 3/N MARCH	ACTURER
1	7. SUBSYSTEM	
1	* UNIT POWER SUPPLY 50869 4 HAC	· ·
62	1 The common the common that the common thas the common that the common that the common that the common tha	
18	2 IA CL MODULE CL MICAM CL CARD	
1	n other	
ORIGINATOR	G 12 TEST WHEN C DEVELOPMENT C QUALIFICATION C INTEGRATION C LAUNCH OPERATIONS OSCENSED STIN-PROCESS C ACCEPTANCE C SYSTEM	*
	13. ENVIRONMENT AMBIENT RADIATION TEMP THERMALA VAC HAS AT WHEN FAILURE AS OBSERVED EMCARE VISRATION AXIS FOR MINITYPE OTHER	
ł	14 DESCRIPTION WHILE UNIT WAS FUSCIONING AT 35 VOLTS BUS IN CLATGE	
	FOR ABOUT & MUNITES, IT SHUT IT'S SELF "OFF" AND COULD NO	<u> 185 </u>
	COMPANIED CO. PRIMERY SIDE FALSD LEQUIDATISISE-DK	TV. CONTINUATION
	15 16603 5.11.6 0.2340 0.00 4755 5-13-81	C SHEET USED
吾	E TAILURE ANALYSIS CR3 AN 51966 ASSY & Q8 ON CHOSSIS FAIL	£0
EVALUATION	DURING TOST. COMPOSIT FAILURE AVALYOS ATTACHED	
13	A SECONDRY WINDS & PRINCES WINDLE STESS ANNUTOR	PITALING
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EER MG	D AL FOLLOWING REWCRIC RETEST RECURSED REMORK IN CARFORSTE E.O. 204668 AL	4 (8 EAGS
333	Being Rometing Diodes and Power Temisistor (4 each	#) <u> </u>
ENGIN	RETEST 73 16603 PAGE 5.116	D. CONTINUATION
1	17.5	CHEST USED
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169		डाउड़)
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3	PART NUMBER CXT SYM PART LOT MUMBER CATE CODE MANUFACTURER PROBABLE DETECT	ANALYSIS KUMBER
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SE.	\$ 908736-3 CR3 7908HE SEATHER	
MANU	TO REMORK BY BECK ER ONG GATE S - 8/ DELEGET CONSIGNATION OF GAZZA ONTE	29- CONTINUATION
-	ELIASA BECKER 41-33 6-15-81 DELEMENT COMPRESSO 41-23:	
ł	TOURS OF THE PRESENT IN THE MAN DISTRICT COME FOR D	100195
	ON ALY 5756	
₹		
18	THERMAL PATH TENDERATURE TESTS ARTER.	<i>M</i>
ELA	ESTORIX INDICATED ACCEPTABLE 1405 MAX ///	
3/8	CASE TEMP AT STEADY-STATE JED 2014 AT CONTINUATION	~ 10
E	2 DOCUMENT IMPLEMENTING FO 20 MA REFECTIVITY SW 18 UP 107	.0 10 1
SEE	A BASIC CAUSE DESIGN TEST EQUIPMENT OF MFG. PROCEDURE WIRING ERROR OUNKNOWN OF VERIFIED OF	DEFECT CODE
engineering/reliability	G FAILURE DEFECTIVE PARTS TEST PROCEDURE ASSY/FAB ERROR ROUGH HANDLING	
-	TYPE MINDUCED IN NO ABURE / CLASSIFICATION IN MAJOR _ SAFETY	CAYE
	1 PT 15/4/50A) 41-37 P/17/81 (12/00/00/11 27/11)	BIJOZA
	3 38 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	DATE
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SPACE AND COMMUNICATIONS GROUP

SP4	CE AND COMMUNICATIONS GROUP TEL SEGUNDO, CALIFORNIA	PAILURE	MEPUM	i e	-	100 8								
	1: PROGRAM NAME AND NUMBER THEMBETC MAPPER	E330	EUGHT	2:00 FM	MO 5 DA	20 YR 81								
	8. HAROWARE LEVEL SPACECRAPT	SUBSYSTEM -	ASSEMOLY (] MODULE	CARD									
	EQUIPMENT IDENTIFICATION:	D TINU	SUBASCEMB .Y (MICAM S/N	PARY									
`	7. SUBSYSTEM	name:	PI HI HUMBER	3/8	- HARUF	ACTURER								
1	& UNIT O SYLEGOLIA		10000	- 	1170									
١	TOWER AD UPPEY		50869	<u> </u>	HARC									
5	C ASSEMBLY D SUBASSEMBLY				<u> </u>									
3	10. C, MOCULE C MICAM C CA10													
OR:GIMATOR			<u> </u>	<u>. </u>	L									
8	OBSERVED ZIM-PROCESS		YSTEM	l Launch Operations										
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1	8. TEST PROCEDURE	IPANA LIS -24	IGHATOR A	Long	DATE	TIZ. CONTINUATION								
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ENGINEERING	P3-12 shield to so	lices 25 F	76-10 A E	Grest TS	16603,	PALA								
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	35. UST ALL PARTS REPLACED		T			ANA PROPERTIME								
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AR.	908939-1 P6	1000	AETESTED BY	! CAG	DATE	SO COMPINIATION								
23	ELIASA BECKER 44-33	6-15-813	DEST COME	ORA 51-33	J	28. CONTINUATION SHEET USED								
T	30. CAUSE AND CORRECTIVE ACTION													
	CAUSE: SPUCE IN SHIE	LOED WIE	s Develo	PED SMO	LT DU	S 70								
Ì	FIFTURE OF MA	AL & BA HVI	PWB.		IL FRO CLOSUAE									
_	Mar Carina R 11:101	16 BeTWE	GAL MAKI	& MINI										
3	Pulk al Rivol	- V		E CCC		,Μ								
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Ž.	FLEXUNG. FOTER	TO ANO DATE		SHEET USED	\$///\\ [®] [0/1/1								
EH	CORRECTIVE ACTION	EST EQUIPMENT G M	FG PROCEDURE (WIRING ERROR	UNKNOWN	DEFECT CODE								
ENGINEERING/RELIABILITY	OF VERIFIED GENVIRONMENTAL G T	EST PROCEDURE	ORKMANSHIP	ROUGH HANDUNG										
<u> </u>	35. FAILURE CAPRIMARY CO	NKKOWN	38. FAILURE	C CRITICAL	MINOR									
		O FAILURE /	CLASSIFICATION	S-MAJOR -	SAFETY									
-	TYPE HINOUCED UN	O FAILURE	CLASSFICATION	SAMAJOR SENGINEER	LORG	DATE								
L	TYPE INDUCED U	3 7/20/81	CLASSFICATION B. SPACE PAFTEYSTE COSTEMEN OR SUPI	WALK		DATE DATE								

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SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT CONTINUATION SHEET

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Bed

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FAILURE REPORT # F4837

There was a shielded wire abort, which put
the center conductor at return ground potential. This
short was in the inter-connecting harness from
MINI-Sw. to the MAYI-Sw. that carries the punc
signal"

XFMR TB

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FAILURE REPORT # F4837

A24-Q6 908839-1 (2N2222A) for a collector execut maximum of 800 ma. Transister Q6 in have runent was 5.6 ma with a collector current of 0.5 amps giving a bate of 89. Transister Q6 in the only romponent in the 0.5 doop paths that was overatressed, due to 12 notes at its collector and a current of 0.5 amps which is 6 water discipation before lits Emille greated.

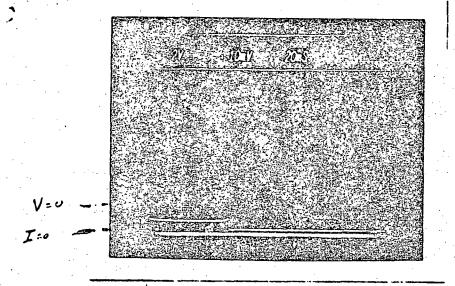
The diodes CR 47 & CR 48 of the MARI-Sir. (A23) 908702-2 (INGO81); these Sides are pated @ 2 amos @ 25 Centi ambient. Each diode convicted o. 5 amos every half such for 70 millipes, which is in-sufficient time for the diode to heat up. Beside of the bade are at 70° Centi the diode for the diode to the diode for Centi the diode can carry 12.0 amos wino stress to diode?

The following two pages have a picture indicating the Collector woltage on top trace @ 21/010. I Emitter current is the bottom trace. @ 1 comp/010. These pages also include the analysis of the Chake L2 & the transformer TES which indicates that site Temperature rise in the wire of each component disn't extend 0.05 degrees FAMPO.

Conclusion is all components are all right But Q'6 must be replace.

FARURE REPORT #F4837

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Yee 24/DIV

IE @ IA/am

£20

Wire $\frac{126}{40.81^{-2}/0^{3}f} + \frac{10^{3}f}{40.81^{-2}/0^{3}f} + \frac{10^{3}f}{40.81^{-2}/0^{3}f} \times .225^{-3} = 4.24 \cdot 10^{-3} \text{ Minding}$

Choke #28 is 64.90 2/038+ , -4837 1/03 ft

-4837 1/03 ft

64.90 2/03 ft × 1.05 -2 = 7.826 1/03 lbe/blue

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Dissipation

FACULE REPORT

XFMR I2-R. duty

(.5A)2.225. = 28.13 mw

Cloke

(5A)2. 1.05 · 1 = 262.5 mw

XFMR

9.416 x 28.13.10 wx 100-10 sec x 1/360 sec

st = 4.24.103 Be x .092 BT4

ot = 6.84.10-3 °F

Ohke

3.416 × 262.5.10 W × 100.10 are a 160 per

7.826 -10 3 lb × .092 BT4

CB OF

△t = 34.6:10 °F

SECTION 2.4
MAINFRAME/ TOP MECHANICAL ASSEMBLY

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2.4.1 Mainframe / Top Mechanical Assembly

2.4.1.1
No Performance data was taken at the subsystem level on this subsystem.

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2.4.2 Acceptance Data

2.4.2.1 Configuration Lists

The "as built" configuration list for the Mainframe and top mechanical assembly is included in the listing for the overall system.

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Listing of Liens

There were no liens recorded against the Mainframe/Top Machanical Assembly.

SECTION 2.5
AFT OPTICS ASSEMBLY

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2.5.1 Aft Optics Assembly

2.5.1.1

No performance data was taken at the subsystem level on this subsystem.

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2.5.2 Acceptance Data

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> 2.5.2.1 Configuration Lists

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AS-BUILT CONFIGURATION LIST

AFT OPTICS ASSY
P/N 51512, S/N 003, FLIGHT

IND	PART NO.		NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	·						
1	51512		AFT OPTICS ASSY		D + 3646A		003
				3896A 3925A	3925A	3896A 3925A	
				3959A 4134A	3959A 4134A	3959A 4134A	
2	50795		SILICON FOCAL PLANE ASSY	H + 3934A 3968A	H + 3934A 3968A	H + 3934A 3968A	201
				3982A W-126	3982A W-126	3982A W-126	
2	50843		AFT OPTICS SUPPORT	, G	G	G	
2	51030		SCAN LINE CORRECTOR ASSY	E + 1012A 3823A	3823A	E + 1012A 3823A	004
				3956A	3956A	3956A	•
3	50820		TORQUE MOTOR, SLC	C	C	· C	003
3	51035	,	MIRROR NO. 2, SLC	C	C	ORIGINAL OF POOR	003
3	51037	* **	MIRROR NO. 1, SLC	C	C	c SA	106
3	51040		FRAME ASSY-SLC	D	D	PAGE IS QUALITY	004
3	51887		TEMPERATURE SENSOR ASSY-SLC	B + 8689-N	B	B 70	401
2	51343		BLACKBODY & MOUNT ASSY	C	C	C	003
3	51346		BLACKBODY ASSY	D + 3906A	D + 3906A	D + 3906A	003
2	51364		TERMINAL BOARD ASSY	B	B	В	
2	51482		SHIM	B *	В		

N-REPRESENTS A NON-MANDATORY CHANGE

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
2	51485	PRIME FOCAL PLANE ASSY	D.	D	D	002
2	51495	CENTER BAFFLE ASSY	C	c	С	003
3	52733	BAFFLE ASSY, B3	C + 3942A W-139	B + 3942A W-139 W-143	B + 3942A W-139 W-143	,
			W-143 **W-143 waives when incorpora	planning f	or EO 8842	which
2	51496	CALIBRATION LIGHT SOURCE ASSY	D + 3960A 4170A	D + 3960A 4170A		
3	51497	LAMP SOURCE ASSY	В	В	В	044 069 113
3	51546	LIGHT SOURCE ASSY	D	D	D .	001 002 003
3	52959	THERMISTOR ASSY	C	C	c	202
2	52249	REDUNDANT/RESTORE SHUTTER ASSY	F + D-134	F + D-134	F + D-134	003
3	52077	SHUTTER ARM ASSY-RED/RESTORE SHUTTER ASSY	C	c	C	003
. 3	52083	POSITION INDICATOR PICKOFF ASSY-RED/RESTORE SHUTTER	C	С	C	203 204 205
2	52500	CAL/RESTORE FAILSAFE ASSY	O B + 1040A 2054A 2054A 3980A 3980A	B + 1040A 2054A 3980A	2054	`
3	51269	HEATER LINK ASSY	Ö Ä R F E + 3790A	E + 3790A	E + 3790	003
2	52544	CAL/RESTORE SHUTTER ASSY	O P	C + 3742A 3969A	3969	1
			≺び 3984A 4040A	3984A 4040A	4040	

P/N 51512

3 of 4

IND LVL	PART NO.	NOMENCL	ATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
3	52345	SHUTTER ARM AS SHUTTER ASSY	SSY-CAL/RESTORE	C + 9163 3871A	C + 9163 3871A 3940A	C + 9163 3871A 3940A	003
				3940A 3958A 3992A	3958A 3992A	3958A ****	
				4017A W-139	4017A W-139	4017A W-139	·
	OF POOR			W-141 ***W-141 waive ew trim opera			r ,
4	51898 2	CAL/RESTORE FI	LAG ASSY	C	c	C	003
3	51898 QUALITY	CAL/RESTORE MO	OTOR ASSY	B + 3306A 3979A	B + 3306A 3979A	B + 3306A 3979A	002
4	52083	POSITION INDIC ASSY-CAL/RESTO		C	С	С	201 202 206 207
4	52446	PWB ASSY, SHUT	TTER LED DRIVER	A + 7155 7498 7713 9359	A + 7155 7498 7713 9359	A + 7155 7498 7713 9359	101
2	52755	CABLE HARNESS, CENTER BAFFLE	, SLC, CAL LAMP, HEATER	C + 3614A	C + 3614A	C + 3614A	201
2	53285	CABLE HARNESS, TELESCOPE BASI	, FOCAL PLANE LED/ EPLATE	B + 3694A	B + 3694A	B + 3694A	201
3	52753	THERMISTOR BLO	OCK ASSY	D + 3794A W-139	D + 3794A W-139	D + W-139	201
·				***W-139 waive required per		l coat chan	ge
2	53649	CAPLE ASSY MAI SHUTTER	IN & REDUNDANT	B + 8787 3695A	B + 8787 3695A	B + 8787 3695A	201
3	51787	THERMISTOR BLO	OCK ASSY	D + W-140	p + W-140	D + W-140	201

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAL NUMBER
2	53694-1	BRACKET, CONNECTOR	В	В	В	003 004
2	53694-2	BRACKET, CONNECTOR	В	В	В	003 004
2	53883	BAFFLE, PRIMARY	A	A	A	
2	54218	SHUTTER STOP ASSY	A	A -	A	003
2	54360	WASHER, FLAT	A .	A	A	
2	54361	SCREW, RELIEVED	A	A	A	
2	54362	WASHER, FLAT	A	A	A	
2	54363	PIN, DOWEL	A	A	A	
2	54504	GROUND WIRE	A	A ·	A	201 202 203
2	54511	SPACER	A	A	A	
2	54562	SHIM	A + 3771A	A + 3771A	A + 3771A	

MV/////3-1282

Quality Assurance

Deregare

Configuration Hanagement Office

ORIGINAL PAGE 19

Listing of Liens

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AFT OPTICS ASSEMBLY

P/N 51512

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AFT OPTICS ASSY.

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HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP FAILURE REPORT

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SPACE AND COMMUNICATIONS GROUP

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT CONTINUATION SHEET

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SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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	THEMATIC MAPPER	(41)	F-1	11:00	MO / DA	6 YR82
	WHEN FAILURE GOVERNMENT STATEM GOVERNMENT STATEM			MODULE MICAM	CARD PART	
	EQUIPMENT IDENTIFICATION: NAME		P.VIT NUMBER	S/M	MARUS	ACTURER
	7. SUBSYSTEM					
1	& UMT					
	A MASSEMBLY U SUBASTEMBLY PERMANANT PROTEST		50010			
5	* ELASSEMBLY SUBASTEMBLY REBUNDANT RESTERE	SAM	52245	9 003	SRRC	
3	11. OTHER				ļ	
ORIGINATOR	Sign made				<u></u>	
8	FAILURE WAS CEVELOPMENT COLAUPICATION OBSERVED IN-PROCESS CACCEPTANCE	U INT	egration [I LAUNCH ("PERATIONS I	•	
	13. ENVIRONMENY AMOIENT RADIATION	C TE	٠	THERMAL VAC	TA SPH	
	WAS OBSERVED EMC/AR UNITED VIBRATION	ERTUL		VPE	□ OTHER	
	OF FAILURE SHUTTER NATURAL			CHANGED	<u>- 15</u>	<u> </u>
	PRESENTLY OUT OF SPEC.	wns	143, 1 17,	5 143.56	175 .	• .
	Siv-2 12 1429 = 13 Mg					
	19. TEST PI. SCELURE PARA		DAL LACE	ORG 22-35	DATE	17. CONTINUATION
	TEL VERIFICATION AND	K	BALINSK		82-1-6	
LUATION	FAILURE AMALYSIS SHUTTER DOES NITT			יד צדועודו	ليباهاساللياة استشبيب	
AT	SCREW TORQUE - NO OTHE			VE BEEN	MADE SU	VCE
A	MOTOR PERIOD WAS IN SPEC.	CHAN	GE 15 AST	ULYED TO	BE RESUL	TOE_
EVA	DRIFT DURING FIRST FEW HOURS	AF.	Trid Gradusticch	OPERATIO	A/a	
2	20. A ROLLOWING REWORK/RETEST REQUIRED CO. REWORK/RETEST NOT REQUIRED SECAUSE RETRIE	m	NERTIA :	TO LOWER	NATUR	44
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2	21. AUTHO	MUZAKON	FR	ORG	DATE	27. CONTINUATION
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	TO LOWER SHUTTER INFRITA			·		2.00-01-3
A NO						A
0						172/
2	23. LIST ALL PARTS HEPLACED CRT JYM PART LOT NUMBER D.	ATE CODE	MANUFACTURER	PROBABLE	DEFECT	ANALYSIS NUMBER
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MANUFA						
S	27. REWORK BY ORG DATE		ETESTED BY	ONG	DATE	23. CONTINUA ION
Н	22-74 1-9-5 30 CAUSE AND					
Ιi	CORRECTIVE ACTION DRIFT DURING	FIRS	TEN	A		TTER
	CPERATION IS APPARENT CAL	UE	OF_SHIP	IN IN	TAL ARS CLOSURE	
	SHUTTER ASSY PLANNING	_ 4/14	L BE N	DRIFIED	A AIS CLUSORE	
E	TO INCLUDE 12 HOUR RUE	1/ /N	_70 ST	ABILIZE		٠ ال
3	MOTOR NATURAL PERIOD.				1 1	. //~
		NGED	ONAPRO	ATTACHED		77 W 132
E	Orce tron SIC# 22-74			TIL CONTINUATION		11/2
2	32 DOCUMENT IMPLEMENTING A HR DATED 6-30	201	C11201	1-6-82	1///	ما رجزا
ENGINEERING/RELIABILITY	CORRECTIVE ACTION HAR DIVED 0-31		SUPPLEMENT D		UNKNOWN	DEFECT COOR
3	OF VERIFIED C ENVIRONMENTAL TEST PROCEDURE	C AS:	G. PROCEDURE SY/FAB ERROR REMANSHIP	REBUSH HANDLING	United Fire	
E	FAILURE DEFECTIVE PARTS TEST SET-UP TE			CECRITICAL	☐ MINGR	<u>.</u>
	TYPE INDUCED IN NO FAILURE	<u>_</u> _	CLASSIFICATION	MAJOR PAR PROPERTY OF THE PAR PENETY OF THE PAR	020	DATE -
	37. AESPONGIBLE ENGISÉER DATE 82-	1-20	(J-7-7-3	- 1//	22-41	1/20/22
	TENTRELIABILITY C. JORG III PATE	a-82	CHETS THE OH SUP	PLUER		OFTE
لب 1011ء	73 SC JAN 80	CS 10	1/27/02	<u>.</u>		
			1/37/04			

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SBRC		ASSEMBLY HISTORY RECORD SUPPLEMENT						
52249	OO3	52249	BENEGET P	22-35	F. Saucier	SUPPLEMENT NO. 5 10		
	Plement – incorporate			W. Balins	PEGI MA APPEDRAL	SUPPLEMENT RELEASE DATE 82-1-6		
ŧ				La Some		NOTE TO PRODUCTION - UPON RECEIPT, ENTER SUPPLIMENT HO. AND RECEIPT DATE ON FROM STEET OF AND, INITIAL THE EMPTY		

NOTES: 16781 Rev. A EO 8293, 8312, 8666, 3647A 76440 Rev. C EO 2371A, 2968A, 3136A, 3293A, 3658A

OPER SIC			PE	RECRIMED		
NO.	NO.	INSTRUCTIONS	OPER	INSP	DATE	REMARKS
		-NOTE- ALL OPERATIONS ARE TO BE PERFORMED IN				
		A CONTROLLED CLEAN AREA SUCH AS A LAMINAR FLOW				
		BENCH, EXCEPT WHEN ENVIRONMENTAL CONDITIONS DUE				
		TO THE NATURE OF THE OPERATION ARE DIFFICULT				
		TO CONTROL: THESE MAY INCLUDE TRANSPORTATION				
		PLATING, SOLDERING, POTTING, MEASUREMENT,				
		PAINTING AND MACHINING. Q.A. SURVEILLANCE IS				1
		REQUIRED FOR ALL OPERATIONS NOTED, CLEAN LINT		•		
		FREE GLOVES FREE FROM ALL CONTAMINANTS MUST BE				
		WORN AT ALL TIMES, EXCEPT WHEN NOTED OTHERWISE.				
		SEQUENCE OF OPERATION MAY NOT BE ALTERED EXCEPT	:			
		AT THE DISCRETION OF THE REA.				

Yanc ASSEMBLY HISTORY RECORD CONTINUATION SHEET SHEET 2 PART NUMBER SERIAL OR LOT NUMBER CONTINUATION OF: ASSEMBLY NAME Redundant/Restore Shutter AHR DATED 52249 003 AHR SUPPLEMENT NG. 5 Assy.-Aft Optics Assy.-TM OPER SIC PERFORMED BY INSTRUCTIONS REMARKS NO. NO. OPER I INSP DATE 22-74 ASSEMBLE SHUTTER ASSEMBLY TO BALANCE FIXTURE NAS2770-29351 22-13 1/7/12 200 22-74 CONNECT SHUTTER MOTOR TO TEST BOX PER SPEC. 16781. PARA 3.9 USE WEAR SAVER 76440-2 AT SHUTTER MOTOR CONNECTOR INTERFACE. 300 22-13 CHECK PERIOD OF OSCILLATION AND RECORD. Resonat Period = 143.6 ms RELEASE TORQUE FROM MOUNTING SCREWS AND ADJUST TO 22-74 400 PRE-TORQUE CONDITIONS

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PART .	NUMBER 52249	SERIAL OR LOT NUMBER ASSEMBLY NAME Redundant/Restor AssyAft Optics	e Shut Assy.	ter TM	CONTINUATION OF: AHR DATED AHR SUPPLEMENT NO. 5		
OPER NO.	S/C NO.	INSTRUCTIONS	PE OPER	RFORMED INSP	BY	REMARKS	
500	22-13	CHECK PERIOD OF OSCILLATION AND RECORD. COMPARE	9.7.		1/7/82		
		WITH RESULT OBTAINED IN OPER. 300					
		Resonant Period = 143.6 ms					
510 :	22-74	TORQUE MOUNTING SCREWS TO 11 IN-LB + 10%.	Brond		1/1/4=		
600	22-74	PERFORM-INERTIA TRIM PER DRAWING NOTES 6 & 7 AND	Sinds		1/9/82	143 06 MS	
		SPEC 16781 REV. A PARA 3.9, 3.10 AND 3.11					
·							
							
700	51-41	QA VERIFY PERIOD	RI	172	1/4/5-2		
	·						
800	22-74	ROUTE TO ELECTRONICS AND RUN SHUTTER UNTIL PERIOD	Sins		1/4/80		
		IS CONSTANT OVER 12 HOURS (RUN-IN NEED NOT BE CON-	6%		1/14/32		
·		TINUOUS). Research Period Before = 143.07					
		Resonat Ferrid ffter = 143.07	<u> </u>				

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PART NUMBER 52249			SSEMBLY HISTORY RECORD CONTINUATION SH SERIAL OR LOT NUMBER ASSEMBLY NAME Redundant/Restore AssyAft Optics				AHR D	CONTINUATION OF: AHR DATED AHR SUPPLEMENT NO. 5		
OPER NO.	S/C NO.		INSTRUCTIONS		PERFORMED OPER INSP		BY DATE	REMARKS		
00	22-74	IF PERIOD CHA	ANGES, ADJUST AS REC	QUIRED. REPEAT OPER	OFER	11:31	- DAIL			
	Cont	600 THRU 800	. IF PERIOD REMAINS	STABLE, CONTINUE				-,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, 		
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SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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]]	THEMI			PPER			F-/	14:	00	MO / DA	18 YR 82
П	8. MARDWARE LEVEL WHEN FAILURE	SPACE		Suga	YSTEM		SSEMBLY	☐ MODUL	£	CARD	,
П	WAS COSERVED	SYSTEM	e .	疑 UNIT		<u> </u>	UGASSEMBLY	☐ MECAM		PART	
П	EQUIPMENT IDENTIFICA	TION:		. N	AME .		PART NUR	DEA	S/M	HAM	JFACTURER
	7. SUBSYSTEM										
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SPACE AND COMMUNICATIONS GROUP

HUGHES AIRCRAFT COMPANY
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FAILURE REPORT CONTINUATION SHEET

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FAILURE REPORT CONTINUATION SHEET

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SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

ORIGINAL PAGE IS-OF POOR QUALITY

_	EL SECUNDO, CALIFORNIA					
	1 PROGRAM NAME AND NUMBER	2. GLA	2 MODEL		MO & DA /	12 YR 92
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